The Communicator

Sep—Oct 2020

SARC

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What kept you busy this COVID summer?

A Publication Of Surrey Amateur Radio Communications

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The Communicator is a publication of Surrey Amateur Radio Communications.

It appears bi-monthly, on odd-numbered months, for area Amateur Radio operators and beyond, to enhance the exchange of information and to promote ham radio activity.

During non-publication months we encourage you to visit the Digital Communicator at **ve7sar.blogspot.ca**, which includes recent news, past issues of The Communicator, our history, photos, videos and other information.

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Regular readers who are not SARC members are invited to contribute a $5 annual donation towards our Field Day fund via PayPal.

SARC maintains a website at **www.ve7sar.net**

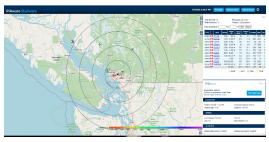
DEPARTMENTS

IN THIS ISSUE

Daniel's Workbench—Has 6 articles this month!

Daniel VE7LCG with another set of fabulous projects including Part 2 of making your own custom QSL card

***Current Projects**—Kevin VE7ZD Writes about 3 of his projects*



A Look At ADS-B

An inexpensive aircraft tracking and monitoring application for your ubiquitous RTL-SDR dongle

QRM -- -.- .-. --

...from the Editor's Shack

Do you have a photo or bit of SARC news to share? An Interesting link?

Something to sell or something you are looking for?
eMail it to communicator at ve7sar.net for inclusion in this publication.

Well, despite the lack of summer club activities around the area this has turned out to be our biggest issue to date! Our usual contributors have come through in a big way, especially Daniel VE7LCG, who has provided content on a wide variety of radio topics. As of this writing there is no sign yet that our meetings and social activities will be getting back to our normal schedule anytime soon.

I am amazed at how resourceful our community is however. There has been an upsurge in YouTube videos, on-line tutorials, Zoom and other conferences to fill the gap. A couple of weeks ago there was even a virtual Ham Expo on-line with vendors and presenters on a wide variety of topics, open to all and free once you sign-in. You just have to look for them on any of the popular blogs, the ARRL or the RAC sites.

We are looking forward to resuming our meetings, although one with COVID-aware protocol. Our COVID plan may be viewed here.

Our plan is to start a Basic course on Tuesday, September 22nd. If permission is granted by Surrey Fire Services, we will have a maximum of 15 students in class and live-stream the presentations to any excess (or those who would rather participate from home).

At the time of this writing, our Annual General Meeting is scheduled for Wednesday, September 9th at 7pm, postponed from last June. We are awaiting clearance to use the classroom but as an alternative will hold the event at Bear Creek Park, weather permitting, if the classroom is unavailable. We'll let you know.

~ John VE7TI
Editor

This Month's Issue...

How did you spend your COVID Summer? Kevin VE7ZD put up a new tower and here he is in the hole as a first step. In contrast, John VA7XB however seems to have taken things a bit more leisurely. However your Summer went, we hope it was a good one. On to Fall!

It takes half your life before you discover life is a do-it-yourself project—*Napoleon*

On the Web

ve7sar.net

Between newsletters, watch your e-mail for news, announcements of Amateur Radio events, monthly meetings and training opportunities.

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The Rest Of The Story…

William Fothergill Cooke

Relegated in History to Wheatstone's Shadow?

William Fothergill Cooke

Following up from the previous issue of The Communicator, which profiled Wheatstone, this issue we look at the story of his close associate.

William Fothergill Cooke was born on May 4, 1806 at Ealing, Middlesex, United Kingdom. William Fothergill was given the first name of his father, William Cooke - a distinguished surgeon who later became appointed professor of anatomy at the University of Durham. William Fothergill Cooke was educated at Durham before going off to the University of Edinburgh. When he attained twenty years of age, Cooke decided to join the Indian Army.

In early 1836 Cooke came to witness a lecture on electromagnetic telegraphy - at the time when telegraph science itself was still only experimental and in its infancy. Dr. Moncke's Heidelberg lecture excited Cooke in that it provided a demonstration of telegraphic apparatus based on the principle introduced by Pavel Schilling of Russia in 1835. Schilling was inspired by two Germans named Wilhelm Eduard Weber and Carl Freidrich Gauss It was Weber and Gauss who had at the University of Gottengin, in 1833 two years before, successfully developed the world's first electromagnet telegraph. Essentially this was an analog telegraph actuator. It though should be understood that the formidable action of the electric telegraph actuator created by Gauss and Weber - was not however functioning just yet comprised in a digital electric manner or by binary electric means.. This electric telegraph demonstration was done over telegraph wire strung in the air between the two building locations, and electrically activated with the analog telegraph actuator that the two German professors devised and put into use. The primary analog action of Gauss and Weber's telegraph actuator paved the way for the essential rudimentary basis of all electric communications today, which has become refined as a wholly digital form of communications. This digital realm of electric communications as has been developed in the last thirty years was spawned towards the last decade of the past Twentieth century - and finitely ushered in the Twentieth-first century inculcated as the essential defacto standard - achieved by total dominant integration with in said paradigm.

in early 1836, however, here now three years in following to Gauss and Weber, Cooke became entranced with what he saw during the demonstration of Professor Moncke and decided to put the novel telegraph invention into practical operation. Cooke sought to take it beyond merely the world of academia.

Prophetically, Cooke reasoned that the telegraph as such could be applied to the railway systems that in 1836, were just beginning to develop commercially at that time. Cooke saw the potential use of the electric telegraph for the safe regulation of train passage. With this most earnest notion conceived for the public good, Cooke immediately gave up the study of anatomical model making and medicine and advised his parents by letter that he would be soon returning home to merry England.

William Fothergill Cooke left Heidelberg and returned to his native England on April 22, 1836, just as springtime was underway. Cooke soon set about writing up proposals for an electric telegraph, with noble intentions of issuing it as a monograph, but never came to publish.

Not long after settling back in London, Cooke had his first telegraph instrument constructed, engaging the primary assistance of Frederick A. Kerby of St. Pancras district, London - and for the clockwork escapements, Moore of Clerkenwell. With his first apparatus in hand, Cooke went about testing its usefulness.

At the office of Burton Lane, Cooke's friend and solicitor, Cooke painstakingly strung over a mile of wire round and round, but came quick to realize that getting a telegraph signal to extend beyond one mile remained a very real obstacle.

The disconcerting dilemma of sending telegraph signals over extended distances prompted Cooke to seek out outside technical assistance. This came through introductions to Michael Faraday and Peter Mark Roget - the prior a noted expert in electrical principles and then latter an esteemed physician, lexicographer and natural theologian.

Through Faraday and Roget, Cooke was introduced to Professor Charles Wheatstone at King's College, London, who prior in 1834, had already presented to the Royal Society an account of his experiments on the velocity of electricity.

At this time Cooke had already achieved constructing a system of telegraphy based on Schilling's principle and utilizing three needles. Cooke also made designs for a mechanical bell alarm, or "alarum," the latter of which some examples are actually found drawn and recorded in Cooke's journal (Codex Lipack). during this initial period of activity, and although still in the experimental stages of development, Cooke had also made some progress in negotiating with the Liverpool and Manchester Railway Company for the use of his telegraphs.

On the strength of Cooke's determination and physical efforts of having telegraph equipment actually produced that did work, not long after meeting together, Cooke and Wheatstone went into partnership in May 1837 (6c). According to published historical accounts set down over the years partnership of Cooke and Wheatstone would rely on Cooke to handle the business side while Wheatstone would be the one providing the electrical expertise.

The discovery of Cooke's detailed 1836-1842 manuscript journal however now provides proof that runs contrary to the inaccurate notion that Cooke's only function was that of being the one behind the 'business side' of the Cooke and Wheatstone telegraph. Granted, Cooke did indeed run all of the 'business side' of the partnership, but the Cooke journal now clearly reveals that his stake in actually inventing and producing working telegraph systems was more prominent than what over a century long breadth of telegraph scholars and historians have led history to believe.

first experimental telegraph demonstration mounted by Cooke took place on the London and Birmingham Railway line, established by George Stephenson, the latter who had introduced Cooke to his son, the legendary Robert Stephenson, the railway's chief engineer.

Between July 4, 1837 and September 6, 1837, a series of three separate telegraph experiments would be mounted by Cooke along the London and Birmingham Railway

lines. The demonstration that the Beaufort October 5, 1837 letter references to Hawes' invitation was likely the last of the three demonstrations; the one which took place on September 6, 1837. This event occurred precisely the month before Beaufort wrote his October 1837 letter to Hawes, with the outdated delay in Beaufort's correspondence presumably caused from his having been away for sometime at sea.

As it was, Cooke had first solicited the Stephenson owned railway concern on June 27, 1837, some two weeks after Cooke and Wheatstone's very first telegraph system was finally tested on July 4, 1837, with the apparatus nestled inside a newly-erected carriage shed of the London and Birmingham Railway at Camden Town, north of London. This trial William F. Cooke mounted at his own risk with a primary objective sought to demonstrate the utility of the Cooke and Wheatstone telegraph in providing safe railway system signaling, by means of electric conveyance.

A second trial installation by Cooke was mounted, commencing on July 17, 1837. A temporary four-wire line was strung between Euston Square and the Camden Town stationary engine house. Once the installation was completed, the actual demonstration before the London and Birmingham Railway company directors followed on July 25, 1837, a week after the installation had begun.

Ultimately, a more permanent line was run by Cooke, advancing to the use of insulated wires buried underground, with its completion occurring by August 31, 1837. The trial for this third demonstration of a near-permanent line took place on September 6, 1837, lasting one hour.

It is however significant to note that Sir Francis Beaufort's October 5, 1837 letter to Sir Benjamin Hawes, referring to this first near-permanent telegraph installation of the Euston Square to Camden Town system and trial of September 6, 1837 - stated that the "telegraph" demonstration he regrettably missed was a grand "experiment" and "one of the most striking novelties of this inventive age." Sir Francis Beaufort's words mark the swell of enthusiasm held by many at the time surrounding the great ushering in of the telegraph 'phenomenon,' which at the time was still regarded as a mere novelty - as Beaufort too, codifies. There were even parlor games based on the older mechanical signal telegraph still being used as entertainment at this time in many English and French homes of the day. The word "telegraph" was fondly discussed and on the tips of everybody's tongue in the 1830's in high society England.

Although Cooke had demonstrated the positive utility of the Cooke and Wheatstone telegraph to railway directors of the London and Birmingham Railway, and to Stephenson, it was deemed by them to be unnecessarily complicated. As much more monies were needed to be earmarked to lay track between Liverpool, Manchester and Holyhead, where there was none, enthusiasm for Cooke's telegraph initiative after the Euston Square and Camden Town demonstration waned. The laying of telegraph line to these points was not an immediate priority for the railway's board. With this notion, Cooke received a letter from the company dated 12 October 1837, with the corporate principals expressing no further interest to pursue any use of the electric telegraph as viable.

Sir Benjamin Hawes M.P. was an early proponent of the electric telegraph. English Parliament member Benjamin Hawes was husband to Sophia Macnamara Brunel (1802–1878); daughter of the famous engineer Marc Isambard Brunel and sister to Isambard Kingdom Brunel.

It was the latter Isambard Kingdom Brunel who had founded the Great Western Railway in 1835 and the principal who would eventually build the celebrated steamship Great Eastern, which would come to lay the first trans-Atlantic telegraph cable in the late 1850s. I. K. Brunel was the company engineer for the Great Western Railway, while Stephenson was the engineer for the London and Birmingham Railway. The Great Western Railway utilized the Cooke and Wheatstone telegraph system early-on as well, and fabrication orders and drawings pertinent to the Great Western

Railway installations, provided to machinist Kerby by Cooke are also found in the pages of the Cooke journal.

When the London and Birmingham Railway declined the use of Cooke's telegraph, there is one account that exists that claims Cooke had been introduced to Brunel by Robert Stephenson. However, the recent discovery of a letter extant, by Francis Beaufort shown herein dated October 5, 1837 and written to Sir Benjamin Hawes, M.P., intimates a different more compelling possibility with respect to how Cooke met Brunel. Benjamin Hawes had apparently attended, at the least, the last trial demonstration of the Cooke and Wheatstone telegraph between Euston Square and Camden Town along Stephenson's London and Birmingham Railway line. Six weeks thereafter Cooke was told by the Stephenson owned railway company they no longer had interest in the telegraph.

Cooke was now looking for new financial sources to support development of his telegraph system and had met Benjamin Hawes at the Stephenson supported railway based telegraph demonstrations. Thus, this October 1837 letter by Sir Francis Beaufort bears more weight towards confirming that Hawes was likely the one who introduced Cooke to Brunel. Support of this too is found in the actual letter Cooke himself wrote to Hawes wife Sophia on May 30, 1838. That letter clearly reveals the propitious meetings Cooke had with Sophia Hawes' brother Isambard Kingdom Brunel and the agreement ultimately that would lead to the instance of the Cooke and Wheatstone telegraph system installation on the Great Western Railway. The success of this installation subsequently, would lead to what would become known as the London and Blackwall Railway telegraph installation of 1840.

business engagement between Cooke and Brunel successively allowed the use of the Great Western Railway lines for further needed experimental trials with telegraph equipments that Cooke was developing now mainly with Frederick Kerby, his "mechanician." A five needle model of telegraph first constructed during the initial telegraph trials between the London and Birmingham Railway was given up as too expensive. Thus, in 1838, an improvement reduced the number of needles to two, and a patent for this was taken out by Cooke and Wheatstone.

Nearly fourteen months following the May 1838 agreement signed between Cooke and Brunel, and after extensive tests and installations, the telegraph system for the Great Western Railway commenced operations on 9 July 1839. At a cost of £2,817, the line traversed a thirteen mile stretch connecting the Paddington with the West Drayton station. This was part of the London-Paddington to Bristol line of the Great Western Railway and was intended for use solely for internal functions of the "GW" railway and was still, essentially, "experimental."

The success of the Great Western Railway telegraph demonstration, even though the installation itself essentially was an internal test of sorts, never-the-less prompted Isambard Kingdom Brunel to seek use the Cooke and Wheatstone system in his new London and Blackwall Railway expansion he was set to launch in 1840. Brunel employed Cooke to install what would be the world's first perfected commercial digital electric telegraph communications system at the inauguration of the London and Blackwall Railway which began the first week of July 1840. This was followed by an installation on Stephenson's London and Birmingham Railway, which finally saw the value of the telegraph after the commencement of the London and Blackwall Railway installation.

Before a parliamentary committee on railways in 1840, Wheatstone stated that he had, with Cooke, obtained a new patent for a telegraphic arrangement; the new apparatus required only a single pair of wires. Yet, the telegraph was still too costly for general purposes. In 1840, for the London and Blackwall Railway telegraph installation, however, Cooke and Wheatstone succeeded in producing the "single needle" apparatus, which they patented. Thus, from that time the electric telegraph became a practical instrument, soon adopted on all of the railway lines throughout the country. Another main aspect of the primary design was

also brought forth during the London and Blackwall Railway installation. This installation combined this simplified "single needle" dial into what became widely known as the "five dial" telegraph system; combing five "single needle" dials from one single needle dial into "five dials."

Cooke's differences with Wheatstone

As inferred herein above, a priority dispute had arisen between Cooke and Wheatstone toward the end of 1840. The matter was simple. Cooke had become alarmed at seeing published information and accounts of the day citing Wheatstone as the sole inventor of the Cooke and Wheatstone telegraph system. Thus, a difference arose between Cooke and Wheatstone as to the share each held in the honor of inventing the electric telegraph.

This question of priority was submitted to the arbitration of the famous engineer, Marc Isambard Brunel, on the part of Cooke, and Professor John Frederic Daniell, of King's College, the inventor of the Daniell cell or battery - on behalf of Wheatstone. Marc Isambard Brunel was the father of Isambard Kingdom Brunel.

Ultimately in the spring of 1841, the Cooke and Wheatstone arbitration process came to a close. A statement dated April 27, 1841 prepared by Marc Isambard Brunel and J. F. Daniell, Esq. known as "The Award" was issued.

The arbitration awarded Cooke the credit of having introduced the telegraph as a useful undertaking which promised to be of national importance, and to Wheatstone; that his researches prepared the public to receive it. The arbitration published a conclusion citing: "....it is to the united labours of two gentlemen so well qualified for mutual assistance that we must attribute the rapid progress which this important invention has made during five years since they have been associated."

The decision, however vague, succinctly pronounced the needle telegraph a joint production. Many historical accounts over the past 170 years show that the telegraph had mainly been invented by Wheatstone. It would be better to more formidably refine this by saying that Wheatstone's grounded scientific guidance oversaw and assured that Cooke's basic finalized designs for the telegraph were fully workable; that they were based on sound scientific principals before they became chiefly introduced by Cooke into society through his concerted and precise business acumen.

Following the arbitration decree, an arrangement was agreed to between Wheatstone and Cooke by which several patents were assigned to Cooke, with the reservation of a mileage royalty provided to Wheatstone.

Historians have credited more of the telegraph's actual invention to Charles Wheatstone over that of William Fothergill Cooke. The discovery of Cooke's manuscript journal however contains substantial documentation, extensive notes and drawings in his own hand regarding the invention of the first perfected digital electric binary action commercial telegraph. This material and data by Cooke is all expected to be made available for future study by scholars and students. Wheatstone on the other hand seems to have left so little documentation in his own hand with regard to the inception of the telegraph, and what little Wheatstone has left to the world amounts to a few pages of theory and basics - but not the actual working drawings used to make the actual Cooke and Wheatstone telegraph equipment.

Cooke achieved Knighthood in 1869. In a letter he wrote on November 11, 1869, immediately after his knighting at Windsor Palace, Cooke wrote the late Isambard Kingdom Brunel's sister Mrs. Sophia Macnamara Hawes to tell her his thoughts about the award just bestowed upon him. In his letter, Cooke complained how his founding corporate entity was not properly compensated financially when the Monarchy, apparently in a somewhat forcible manner through an unjust Act of Parliament - took over Cooke's creation of the Electric Telegraph Company for the public good, with what he thought to be improper procedure and

compensation. Cooke intimated to Mrs. Hawes detailed sentiments of his Knighthood that has eluded history and not been properly addressed by historians in nearly 150 years. Cooke stated in part;

"I have today had the honor of visiting upon her Majesty at Windsor! I feel the honour I have received quite adequate to my personal deserts - but I am morally convinced, that the country which originated and realized the Electric Telegraph, and the Gov't. which takes possession of it by violence - i.e. by an Act of Parliament, must hold the national honor very cheap - when a Knighthood given to an old man after 34 years of labour - and a sum of money to shareholders in a Company - are deemed sufficient acknowledgement of the introduction of an invention, now about to be a national Institution, which in its own line can never be surpassed."

Cooke also wrote that this was his "first letter after receiving the honour which I owe to your Father and your husband." Mrs. Hawes' father Marc Isambard Brunel presided over the heated arbitration of 1840-1841 between Cooke and Wheatstone pertinent to equal acknowledgement over the invention for which Cooke felt at the time he was not properly presented publicly.

William Fothergill Cooke later tried to obtain an extension of the original patents, but the judicial committee of the Privy Council decided that Cooke and Wheatstone had been sufficiently remunerated.

Wheatstone had been bestowed the same honor of a Queen's knighting conferred upon him the year before, on January 30, 1868.

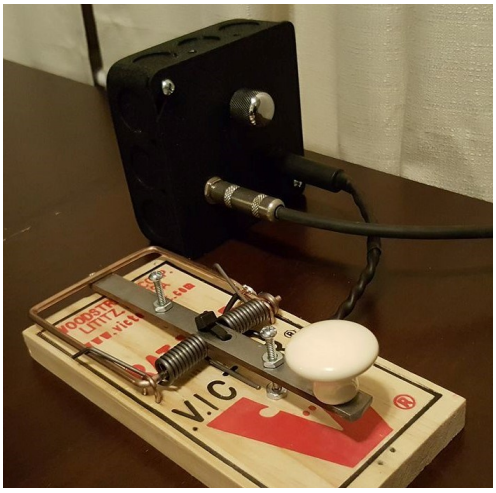
The Albert gold medal of the Society of Arts was awarded on equal terms to both Cooke and Wheatstone in 1867, two years before Cooke was knighted by Queen Victoria. William Fothergill Cooke was bestowed the honor of the Albert gold medal for his service to telegraphy. The Cooke journal / Codex Lipack of recent discovery in the latter part of the 20th century represents the earliest full record of this service extant.

It should be noted that William Fothergill Cooke had lost the great fortune he had made in telegraphy developing a remarkable earth boring machine for use in mining during the mid-19th century. Cooke's earth boring device was actually the precursor to the modern tunnel boring machines (TBM) of today, used for example, to create the Orlovski Tunnel in St. Petersburg. Cooke subsequently died in relative obscurity, and is today, relatively unknown.

Most interesting, one will find that the death of this man - one who had come to create the very essence of modern electric communications, was no less humble than when he had first started his quest. Plus, the cryptic discovery of William F. Cooke's journal, found in America, thousands of miles away from where it was created in Great Britain, adds even more humbleness to what shall forever seem a most enchanted story to many. There will always be the 'lore' behind the 'discovery;' a key to a great element in modern man's history that had been lost for over 150 years. A civil list pension was granted to Cooke in 1871. He died on June 25, 1879.

And that is his story.

~ See also http://williamfothergillcooke.com/



Early telegraph key?

Peter Vogel VE7AFV

Amateur Radio Operators Send Balloon Around The Globe

Peter joins us from Coquitlam, B.C.

He is a Tech journalist, and retired teacher of ICT/Physics.

In addition to Ham Radio Peter enjoys astronomy, meteorology and cybersecurity.

As I've mentioned in a previous column, I have had an amateur radio licence (both basic and advanced certifications) for decades but only relatively recently returned to the hobby, known more commonly as ham radio.

Over the past year or so, my interest has been really piqued by a small team of ham radio enthusiasts in, of all places, Memphis, Tenn. A weekly radio show produced there by Tom Medlin, who operates as W5KUB, led to a chance meeting with another operator, Bill Brown, WB8ELK.

For years, Brown had been launching balloons as a hobby and tracking them via small radio transmitters. The men's encounter led to an effort to launch a radio-equipped balloon that might possibly circumnavigate the planet, broadcasting its location every 10 minutes or so.

When I first learned about their efforts, they were on attempt number five. How exactly the early attempts ended I'm not sure, but I was captivated that amateurs could put together a project that could conceivably see a small balloon circle the globe while broadcasting details that others could capture thousands of kilometres away.

So with each attempt I began my efforts to pick up the signal from their balloons. However, with the prevailing winds at altitude moving mostly west to east, I had to wait until the balloon had nearly completed a full circuit of the earth before my simple antenna system would have a chance of detecting the balloon's signal.

With each attempt their balloon would travel farther – Spain, Poland, China, for instance – before a storm brought it down. I eagerly followed the path of the balloon, on various mapping sites. These would take the weak signals it transmitted and that were intercepted by ham radio operators within range and plot the corresponding positional data.

Ed and Tom precisely filling the SBS-13 balloon with 8 grams of free lift

Then came attempt number nine. As before, I began tracking the balloon, seeing its signal picked up by amateurs elsewhere on the planet. With each successive day I became more optimistic that I too might have a chance. Following a sine wave pattern of the jet stream, all the way up at 42,000 feet of altitude, the balloon moved across the Atlantic, Europe, the Middle

East, northern India, China, Japan, and finally the Pacific.

And so it was that when the W5KUB balloon was about to complete that first loop of the planet, I picked up its beacon, while it was high over Las Vegas. Needless to say, I was elated. In two brief bursts of digital data the balloon was able to transmit its position, altitude, heading, and speed.

A day later the balloon crossed its launch meridian to complete that elusive circumnavigation. Now, as I write this, the balloon is on its third lap, continuing to maintain an altitude between 40,000 and 43,000 feet. That altitude varies slightly with atmospheric pressure. Laps appear to be taking about 20 days.

This third lap has illustrated nicely how unpredictable wind speeds and directions can be. With just a few hours to go before crossing its home meridian, the balloon made a sharp 90-degree turn and headed north, over Saskatchewan, well into the high Arctic, eventually coming back to lower latitudes and even B.C. airspace.

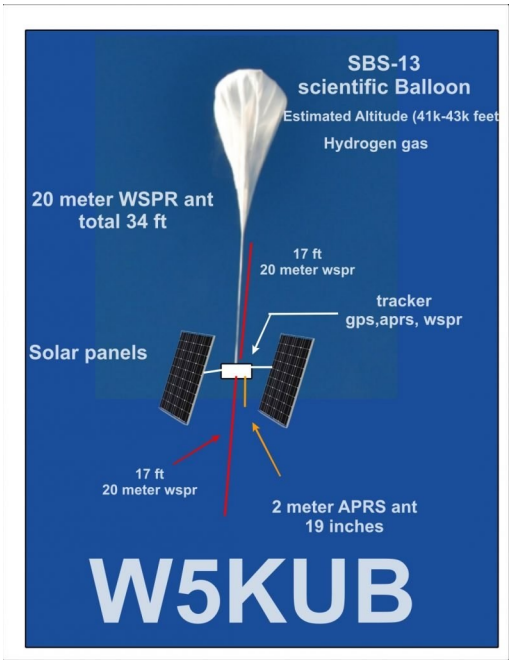
Picking up the balloon's radio signal is no mean feat. First of all, the power output of the transmitter is a mere 10 milliwatts. To put that in perspective, five million such transmitters would be the equivalent of one Vancouver AM radio station

This signal uses a highly specialized protocol called WSPR, weak signal propagation reporter, designed by Nobel Physics laureate Joe Taylor, also known as ham radio operator K1JT.

WSPR and other weak signal modes have brought an entirely new dimension to ham radio, making it possible to communicate over vast distances, even in conditions that are regarded as poor for radio.

In my case, I use a very simple piece of wire, about 30 m in length, slung between two trees about 4 m above the ground. This wire is connected to a software-defined radio, an inexpensive device that evolved from converters developed to allow old TVs to receive digital signals. The rest involves the magic of free software that takes in the weak signal pulses from the balloon and other transmitters all over the planet, decodes them, and displays the useful information they contain.

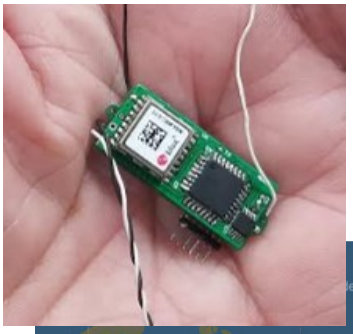
As for the balloon design itself, Tom Medlin notes that they have tried various versions, finding that the dollar store mylar varieties tend to climb only to 30,000 feet, within reach of journey-ending high cloud tops.



More reliable, and also more costly, at around $200 for the balloon alone, is a model known as the SBS-13. Mr. Medlin describes it as looking like a large clear plastic clothing bag, which reaches a size of about two metres in length when the balloon is at 45,000 feet. Interestingly, the launch team uses hydrogen rather than helium for the balloon's lift. There are several reasons for this, among them being cost (helium has become notably expensive in recent years), extra lift for a given weight, and longevity of the balloon, hydrogen not diffusing as readily through the balloon skin as does helium.

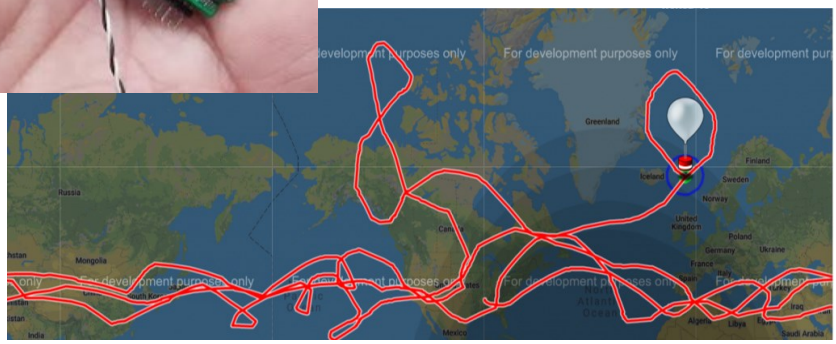
Perhaps most amazing about the entire project is the two-gram electronics payload designed by Eduard Voiculescu, YO3ICT, in Romania. This WSPR transmitter, along with a GPS receiver, is powered by a lightweight solar panel and assembled by Medlin under a microscope.

Want to follow the balloon for yourself? Go to WSPRnet.org, click on Map, select 20 m for the radio band, and enter W5KUB in the Call box. Daylight hours only! Or try APRS.fi, enter W5KUB-18 in the Track callsign box. This latter site interpolates data from the WSPR transmission and can look back up to seven days.



Lest you think that balloon experiments are something from yesteryear, it is worth noting that Project Loon balloons (from Google parent Alphabet) are now delivering internet service across Kenya. Three of the Loon balloons were over Vancouver last month.

Balloon launch video **https://www.youtube.com/watch?v=KJKajJuuREA&feature=youtu.be**



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~ Peter VE7AFV
pvogel@outlook.com

Reprinted from The BC Catholic Newspaper
https://bccatholic.ca/voices/peter-vogel/amateur-radio-operators-send-balloon-around-the-globe

SBS-13 Mission and Goal

On this flight we are not going for laps around the world, although the balloon is very capable of that. We are testing some special circuitry that will allow a LiPo battery to operate at altitudes of 40,000 ft and at temperatures of -40 to -70C. Special charging circuits have been designed and special arrangements have been add to heat the battery during the day to allow charging. The battery capacity is enough that we hope to provide nearly 24 hour tracking..

The balloon will be filled with hydrogen to obtain higher altitude. Because of the excessive weight of the battery, our altitude will be limited. Calculations show we will probably reach a float altitude of 40,200 ft.. We will receive tracking every 10 minutes via WSPR on HF.

Tracking data will give us Altitude, Speed, Voltage, Temperature, future course predictions. This payload is very heavy coming in at about 30 grams. That limits our top float altitude.

Transmissions will be turned off over the UK, Yemen, and North Korea due to regulations.

WSPR

Our WSPR transmitter works on HF at 14 Mhz and has a range of over 5000 miles. It is only running 10 mw of power. Baud rate for data is 1.4 Baud. Yes you read it right 1.4. The signal bandwidth is only 6 Hz wide. Standard WSPR does not give us all the data we need. We are using a modified WSPR protocol which uses an additional time slot to send GPS data information.

The payload consists of a home made tracker (yo3ict design) that contains the GPS system, and an HF transmitter running only about 10 milliwatts. This is less power than most of your BlueTooth devices at home. We are trying a different power system on this launch. The solar panels are dual 4.8V volt 50 ma panes Giving us 100 mA of current. No super capacitor in use on this flight since we are flying a battery.

Page 13—News You Can Lose

The Lighter Side of Amateur Radio

New 'QRT' Amateur Radio Certification Coming

Canadian Amateur Radio operators will be excited to hear that a new class of license will be available starting September 1, 2020: the Quiet Radio Transmitter or "QRT" license. To qualify for this license you need to simply agree to never transmit.

A 2019 study found that 73% of hams never transmit. Most interestingly, the study found a third of those not only don't want to transmit, but object to others transmitting, preferring to have silence for hours, if not days on end. As one survey respondent said, "We invested over $1000 in equipment to setup our club's repeater and yet people think they can just use it as if this were a hobby. It is really bothersome to hear someone looking for a QSO. It only encourages others to join in and, before you know it, everyone's on the air disturbing the peace and quiet."

Responding to the survey's results, commercial interests proposed the QRT license be created. During the consultation period no-one from the ham community spoke up, confirming that the license was a perfect match to the needs of many hams. One exception was a special interest group who requested an endorsement be created allowing for frequent short transmissions, such as kerchunking of repeaters (provided you never say your call sign) or dialing DTMF to turn off a link.

A second endorsement was also agreed to after a letter was received from a meeting held at Tim Hortons requesting that some QRT licensees should be able to say, "That's not real ham radio" whenever someone is talking about new technology.

A third endorsement, the "stuck microphone with road noise" was not adopted as this was agreed to be a form of lengthy transmission, something that was in opposition to the spirit of the new license.

Hearing the news, a local Amateur instructor and examiner said, "This really is a game changer. The QRT license can be earned in a single day, except for the kerchunking endorsement which can take an extra day to practice using a test repeater we have setup in the classroom. Mind you, some people think the extra day is worth it as you can earn a new 'Kerchunked All Repeaters' award in as little as 24 hours using just a simple handheld radio."

Commercial interests across the country are welcoming the arrival of the QRT license. Speaking at a spectrum auction, an industry representative said, "This really speeds up the process of taking back our VHF and UHF spectrum from the Ham community. As people see the benefits of a QRT license such as no antennas, longer battery life, and no RFI, they will quickly see that it makes sense to hand over the spectrum to us so more kids can send emoticons to each other instead of wasting their time experimenting with electronics."

Is your license a QRT license? Perhaps consider upgrading.

~ Adrian VE7NZ
http://ve7nfr.com/blog.html

Radio Ramblings

Kevin McQuiggin VE7ZD/KN7Q

Current Projects at VE7ZD

It's been a busy summer here at VE7ZD. I've been hanging out on 6 metres and worked a number of new stations both on meteor scatter and via E scatter propagation. I am also in the middle of putting up a new 40' tower for a suite of VHF/UHF antennas. I always have about five or six projects going, so this month here's some info on three projects which are currently "on the bench".

A) 23 cm Heating Duct Antenna:

My recent acquisition of a new Icom IC-9700 was driven, in part, by the rig's coverage of the 23 cm band (1240 to 1300 MHz). I have not been on 23 cm for over twenty years. It would be nice to get back on the band both terrestrially, and for EME ("moon bounce"), an activity that I have never tried on that band.

I had read a couple of articles describing EME on 1296 MHz and it looked doable on a modest budget. 23 cm high gain antennas are small, and it is possible to build an effective two- or four-element EME array in a small, lightweight footprint. I am building a 23 cm EME antenna using 45-element loop Yagis, but this will be the subject of a future column!

Figure 1 – Adjustable Heating Duct

To start on 23 cm, however, I needed a simple antenna to explore the band. I wanted directivity, as the IC-9700 only produces eight to ten watts on 23 cm. Investigation of options in the ARRL Antenna Book and on the 'net turned up some simple designs using metal coffee cans [1]. The cans, at about 6" in diameter, are just the right size to be effective waveguides at 23 cm.

Laura (VE7LPM) and I scoured Safeway, Save-On, Superstore and other food outlets for a suitable can without success. Eco-friendly packaging has just about eliminated the use of metal for large food containers. No luck; a couple of pickle cans and "mega" size tomato paste cans were close, but I couldn't justify spending money on ten pounds of Gherkins when the can size was not close enough. And I don't like Gherkins that much anyway, despite the fact that they are high in potassium [2]. I was back to the drawing board.

Serendipity struck: a few days later, we had occasion to visit Lowe's on an unrelated house project, and through sheer luck my wander through the heating department put me in the aisle holding adjustable aluminum heating ducts. See Figure 1 *[left]*. The lightbulb went on – a couple of sizes of standard home heating

ducts are about 6” in diameter. Not perfect, but likely close enough. The ducts can be adjusted to be straight rather than curved, and they cost only about $10. They even have end caps that can be banged into one end of the duct section to seal it off. I could use these two parts to build my own “can”. I bought an adjustable duct and one of the end caps. My 23 cm antenna was literally “in the bag”.

But the articles on coffee can antennas that I had found were specific to a 3” or 6” can’s standard dimensions. Where to put the feedpoint?

In the interim, I had spoken with my good friend Dennis, VE7BPE/AC7FT, who works as an R&D RF Design Engineer in Oregon. Dennis knows the mathematics behind waveguides and was able to send me a simple set of calculations for building an effective waveguide antenna at a particular frequency [3].

The waveguide in this case would be a cylindrical section of heating duct. I was able to use these equations to determine where to mount the “probe” (feedpoint) inside the heating duct. This compensated for the duct’s difference from being exactly 6” in diameter.

I sealed up one end of the duct section with the end cap, cut a small hole in the side of the duct to mount an N connector, soldered a “probe” (radiating element) of about 7 cm long onto the N connector inside the can, and (appropriately) secured everything in place with duct tape. See Figures 3 and 4.

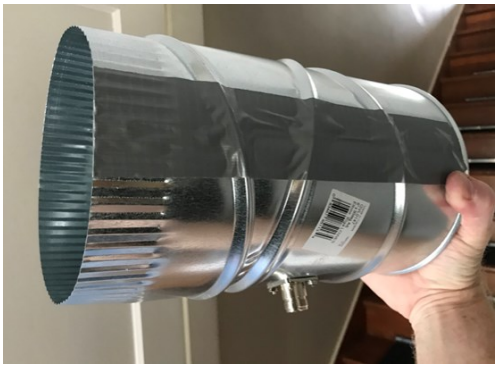


Figure 3 *[top right]* My 23 cm Waveguide Antenna

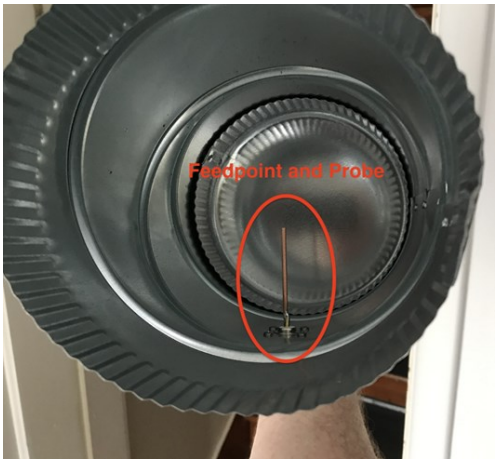


Figure 4 *[middle right]* Interior of Antenna Showing Feedpoint and Probe

Now it was time to test the new antenna. The location of the N connector and length of the radiating element or probe came from Dennis’ equations.

The IC-9700 has an integrated SWR meter, so I moved the rig, power supply, and new antenna to the backyard and mounted the antenna on a handy camera tripod pointed straight up. A short length of LMR400 connected the antenna to the rig. See Figure 5 for my test setup.

Figure 5 *[lower right]* Test Setup [4]

I fired up the radio, set it to 1296 MHz at less than a watt output, and keyed it (using CW mode to ensure that I got a constant carrier output) – “tuning up for maximum smoke” as the old ham radio adage goes…

SWR was over 10:1 and I was initially disappointed: I had done the calculations very carefully – why was the SWR so high?

The mathematics of these things always assumes that the antenna’s components and related factors are perfect: in this case, that the waveguide (i.e. the ductwork) is perfectly smooth, has exact dimensions, that the probe is mounted exactly where it should be, that the radiating element is uniformly smooth, has the exact length required, et cetera. In the real world, these conditions are never achievable, so the initial performance of a new antenna will probably not be as predicted. This thought buoyed my disappointment a bit.

Experimentation is always necessary to account for real world differences from the perfect mathematical model. Honestly, as I have some experience with this sort of thing, I had expected high SWR, but the 10:1 value was unusually high given that I had tried to match the calculated dimensions from Dennis' equations quite closely. I initially thought that I had a short in the feedline or something.

As we know, SWR can be high due to a number of factors, but a primary reason can be mismatch of the length of the radiating element to the wavelength of the signal being transmitted. The probe in this type of antenna should be about ¼ wavelength in height [5]. If the radiating element is too short or too long then this can greatly affect SWR, especially at UHF frequencies.

I got a piece of paper and recorded SWR as I clipped about 1 mm of length from the radiating element inside the can over several test transmissions. My goal was to hopefully see the SWR get lower and lower, and then start to rise again. I would then have found the proper resonant length of the radiating element inside the can.

Nothing happened for quite awhile (about 5 snips), and then I noted that SWR had started falling. It continued to fall for about another 10 snips, and then stayed low (around 1.3:1) for a few snips.

This presented a dilemma: would the SWR continue to decrease (I was hoping for the elusive 1:1), or would it start rising again? In this case, I would have snipped too much off and the radiating element would be too short. Darn!

I decided to keep going to see what would happen. Indeed, the SWR started rising again after a couple more snips, and then it started rising again quickly. Fortunately as I had been recording probe length and SWR with each snip, I had a record of how long the probe should be for best SWR [6]. This shows the importance of taking the time to record observations.

I now had the optimal length, so I retreated to the workshop, removed the N connector from the duct section, and replaced the probe with one that I had measured to the "best SWR" length. Reinstalled into the duct I tested the antenna and found that it worked optimally, with SWR about 1.2 or 1.3 to 1. Not bad!

After a further short test in the backyard, VE7LPM and I loaded the gear into the back of my vehicle and we headed up to Central Park in Burnaby. I set the antenna up on an old camera tripod pointing at Mt. Seymour and VE7RPT's 23 cm D-Star repeater, switched to digital voice mode, and was able to access the repeater and have a short QSO. See Figure 6.

Figure 6 *[left]* Final Testing in Central Park

Once I get the new tower completed, the "heating duct" antenna will be affixed to one of the tower legs pointing towards VE7RPT.

B) AFSK Transmitter in gnuradio:

Here's a rundown on a second summer project. I've written about gnuradio before in this column: it is an open source software-defined radio (SDR) package that is pretty easy to use [7]. I have used gnuradio over the past five years or so to learn about DSP and signal processing, and to develop some fun radio receiving and decoding packages.

I have used digital radio modes (CW, packet radio, RTTY, PSK31, FT8 et cetera) for years, but I always wanted to learn more about

"packetized" digital communications works. There is no better way to learn than by doing, so in June I set out to develop a small home-designed digital communication system.

For the first stage in this experiment I thought that I would develop a simple audio-based digital system that could legally operate on the HF bands. Like RTTY, this system would use one audio tone for a binary '0' and the other for a '1'. This is called "Audio Frequency Shift Keying", or AFSK. I would try to build this system entirely in software.

The goal of my gnuradio "flowgraph" would be to read input from a file or the keyboard and translate the 1s and 0s of the input data stream into audio tones which I could then transmit on HF (or on any frequency, really). The audio tones would go into the "Line In" or the mic jack on a rig where they would modulate the transmitter.

On the receive side I would have to detect these two tones in the receive passband, translate them back to 0s and 1s, recover the original characters from the bitstream and save them into a file or display them for the user.

Receivers are always much tougher to build than transmitters, so I tackled the transmitter first because then I would have some audio data that I could use while designing the receiver. I'll describe how I built the transmitter here [8].

Gnuradio functions are based on "blocks". You choose a block for a desired function, drag it onto the gnuradio desktop (they call it the "canvas"), and then connect it up to other blocks using your mouse. I put some text into a file as a transmission source and saved the file [9]. For test purposes, the transmitter would simply transmit the text in the file. I then dragged a "File Source" block onto the gnuradio canvas. The "File Source" block reads data a byte (character) at a time from the input file and passes the byte onto the next block in the flowgraph. The block can be set to repeat the data in the input file over and over.

So, I had a source of data in the flowgraph; I just needed to translate the bits which represent each character in the file to the two audio tones for 0 and 1. We need to look at a few details.

As we all know, bytes contain 8 bits. The ASCII character "A", for example, takes up just one byte and is stored in our computers as the bit sequence "01000001". In an AFSK transmitter of this kind, we need to transmit a bit at a time, so we need to convert "01000001" to a stream of eight single bits, e.g. "0, 1, 0, 0, 0, 0, 0, 1".

Once we have a character from the file translated to its corresponding eight individual bits, we need to convert each of the bits in turn to the correct audio tone for either zero and one, and then transmit the tone. How can we do this?

Well, gnuradio has a block that "unpacks" bytes. It will accept a byte as input and output the eight individual bits in that byte, one by one. This is what I needed! Then I could use the individual bits to determine the correct 0 or 1 audio tone and send that tone to the transmitter. I added an "Unpack Bits" block to the output of the "File Source" block.

The next problem I faced was how to translate a 0 or 1 to a specific audio tone. What tones should I use anyway? It is good to keep the tones close together in frequency so that they can fit within the bandwidth limits on the HF bands, but if I make them too close together in frequency then the receiver may have difficulty in telling them apart. Spacing of tones under about 200-300 Hz would be fine.

I thought about this problem a bit and decided to use the historical tone frequencies used in amateur radio RTTY for "mark" and "space". I could use the "mark" frequency for 0 and the "space" frequency for 1. There is really no requirement for this – I just needed to choose two tones.

So, with a nod to the history of amateur radio and a tip of my baseball cap to RTTY, I chose 2125 Hz for a 0, and 2295 Hz for a 1. See https://en.wikipedia.org/wiki/Radioteletype for a bit of history on commercial and amateur RTTY.

Back to the problem of how to generate an audio tone at a specific frequency in gnuradio. I had to do some research in the gnuradio manual and on the 'net.

Through some reading, I discovered that gnuradio contains a block called "Voltage Controlled Oscillator" (VCO) that generates a sine wave at a specific frequency based on a numeric input. Great! I could send the block the number "2125" and get an audio signal out of the block at 2125 Hz. This looked like a very good solution.

All I had to do was translate the data stream, now looking like 0,1,0,0,0,0,0,1, into a list of frequency values. 0,1,0,0,0,0,0,1 should be converted to 2125, 2295, 2125, 2125, 2125, 2125, 2125, 2295 in terms of frequency values. These numeric values could go into the VCO block and cause it to generate the correct audio tones for "A". But how could I do this automatically?

Gnuradio includes mathematical and arithmetic blocks. A binary '0' input needs to generate 2125, while a binary '1' needs to generate 2295. If I could automatically convert each bit in the stream to a frequency value, then I could then feed this stream of numbers into the VCO.

If a bit in the input bit stream input is x, then this simple arithmetic statement would do the trick:

Tone Frequency = 2125 + (x * 170)

If x is 0, the output tone value will be 2125. If x is 1, output will be 2295. This looked promising!

I dragged add and multiply blocks onto the canvas and hooked them up to compute the output value for a corresponding 0 or 1 input. This value could then be used as input to the VCO block to generate the correct output sine wave at either 2125 or 2295 Hz. See the green highlighted section in Figure 7.

I wanted to listen to the output of the process to see how it worked. How to get the audio tone out of gnuradio? In this final step I used an "Audio Sink" block, which simply takes its input and sends it to the computer's speakers. Then I could listen to the output and see if it sounded like the flowgraph was working. If the output sounded alright, I would then make a cable and feed it to my transmitter. See Figure 7 for my transmitter flowgraph as it looked at this stage.

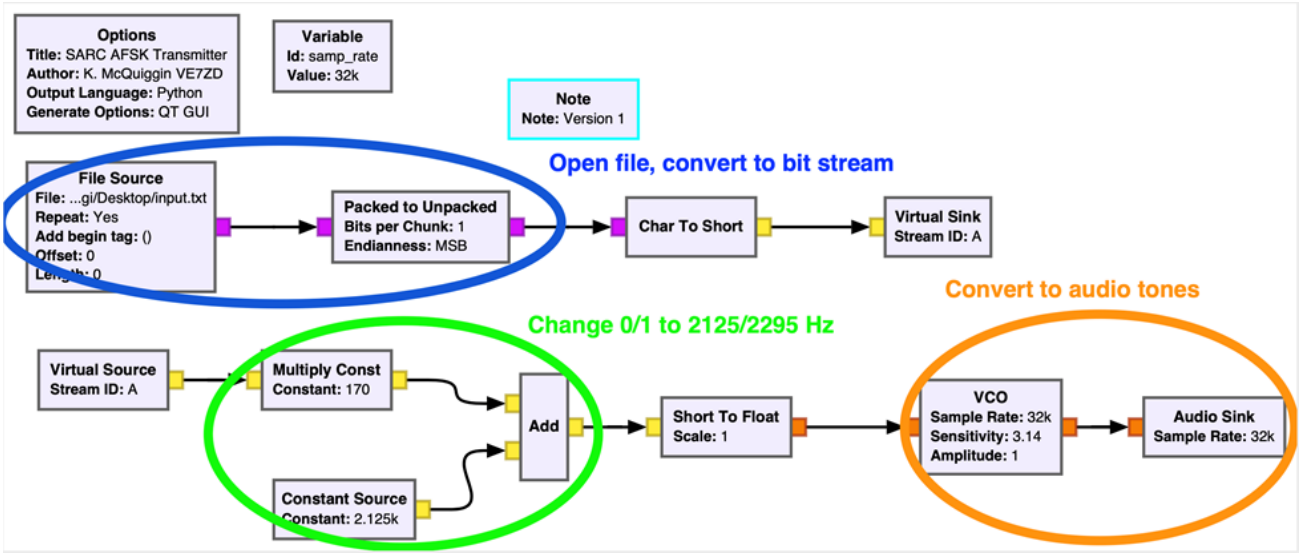
Figure 7 *[below]* First Transmitter Flowgraph

I saved the flowgraph. It was time for testing.

Hmmm: the audio output from the flowgraph didn't sound like RTTY at all. I didn't hear the expected tones, just a loud, continuous hiss. You can listen to this flowgraph's audio output in file A.wav at:

https://www.dropbox.com/sh/mwoe8ckmcf6q7hj/AAAyFGleAbzmPQSjuexplcgua?dl=0

There was clearly something wrong!



Then it dawned on me: I had not factored in the data rate for the audio output signal. While the two tones were correct, I also had to calculate the proper length of each of the "mark" and "space" tones. RTTY on HF ran traditionally at a data rate of 45.45 "baud", or 45.45 symbols per second. The flowgraph was sending the 2125 and 2295 Hz tones far too fast, at the flowgraph's default sample rate of 32,000 symbols per second! That's why the flowgraph's output sounded like a hissing sound.

I needed to, in effect, slow down the tones to make them meet the standard RTTY data rate of 45.45 symbols per second.

32000 divided by 45.45 gives 704.1: I had to slow down the tones by a factor of about 704. How could I do this in gnuradio?

It turns out that gnuradio has a block called "Repeat". This block takes each of its input values and repeats the value a specific number of times at its output. I could use a repeat block, with a repeat factor of 704, to in effect slow down (or "stretch") each of the input tones to achieve an output data rate of 45.45 baud. Then the simulated RTTY output signal should sound normal. This seemed like a good idea (at least it was the best idea I could think of at the time!), so I modified my flowgraph by adding a Repeat block as shown in Figure 8. The repeat block is inside the blue circle.

Figure 8 *[below]* First Revision of Transmitter Flowgraph

Back to the test bench. I ran the flowgraph. This time the output sounded okay in that I could hear the distinct 2125 and 2295 Hz tones, but the overall audio signal was very choppy and had a staccato character that made the overall signal not sound like RTTY should. You can listen to this revised flowgraph's output – file B.wav at:

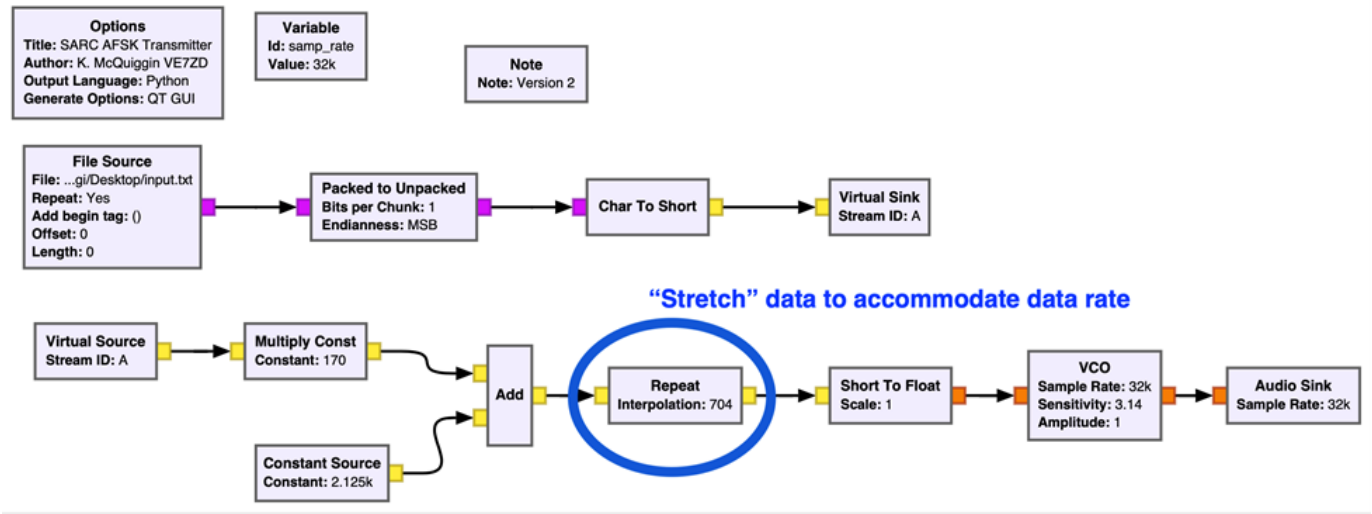
https://www.dropbox.com/sh/mwoe8ckmcf6q7hj/AAAyFGleAbzmPQSjuexplcgua?dl=0 .

I had made progress, but there was still something wrong. Back to the drawing board…

My conclusion after some thinking was that the "Multiply" and "Add" blocks were performing poorly and causing delays in propagating the proper tone values to the later parts of the flowgraph. These blocks are circled in green in Figure 7. Multiply in particular is a time-consuming arithmetic operation.

I thought that I should try replacing this "multiply/add" process with a more efficient gnuradio block to see if that fixes the choppiness. If I could improve the speed of the conversion by getting rid of the inefficient multiply block, then maybe this would eliminate the choppy sound of the tones at the output.

I happened to have a handy gnuradio block in my back pocket, called "Bits to Hz". This is a non-standard gnuradio block [10]. Its function is to output one of two numbers depending on



whether the block's input is 0 or 1. The "Low" and "High" block parameters represent the low and high tone for 0 and 1 which will be output by the block.

I dragged a "Bits to Hz" block to the canvas and set it up to output 2125 if the input was 0, or 2295 if its input was 1. As a custom-coded block, the performance of the flowgraph would be much better than using a combination of multiply/add blocks as I had in the first version of the flowgraph [11].

Back to the gnuradio canvas, I removed the Multiply and Add blocks and replaced them with the new Bits to Hz block configured as stated above. The revised flowgraph is shown in Figure 9. The new block is circled in blue.

I ran the flowgraph and was rewarded with a proper-sounding RTTY signal, as the text in my input file (specified in the File Source block) got transmitted over and over into my laptop's speaker.

Figure 9 *[below]* Replacement of Multiply/Add Blocks With "Bits to Hz"

You can listen to the final version's audio output in file C.wav at:

https://www.dropbox.com/sh/mwoe8ckmcf6q7hj/AAAyFGleAbzmPQSjuexplcgua?dl=0

For those readers with some RTTY experience, note that the tones and data rate sound like an RTTY signal should. Success!

In terms of my project, the next step would be to cable the laptop's audio output to my rig's "Line In" jack and send the tones over the air on a specific frequency.

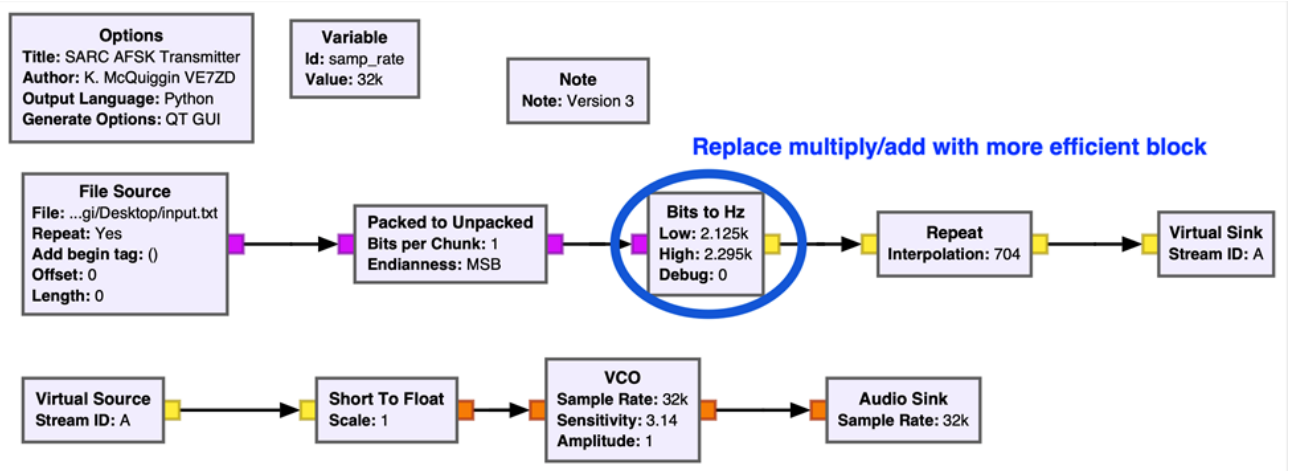
Next column I will talk about how to design a gnuradio AFSK receiver to recover the original textual data from these audio tones. Reception is always much tougher than transmission as the data stream needs to be aligned with a known starting point before data can be correctly recovered. This process is called "synchronization" and is a key problem in designing all digital receivers.

C) GPS Disciplined Oscillator:

Here's the final project for this month. Over the summer I acquired a device called a GPS Disciplined Oscillator (GPSDO) for use in setting my shack's clocks and my rig's frequency references.

A GPSDO uses the very accurate time signals available from GPS, GLONASS or other satellite-based time/position services to generate reference frequencies and timing signals which are accurate to a few parts per billion. Typically, a GPSDO locks onto the GPS constellation and uses the GPS signals to control its own internal oscillator. Once locked, the device outputs an extremely accurate sine wave at a chosen frequency, usually 10 MHz.

My new IC-9700, and most other new rigs, have a "Reference In" SMA jack on their rear panel that allows them to be connected to a time or



frequency standard such as a GPSDO for more accurate generation of RF frequencies within the rig. See Figure 10 – the "REF IN" jack is circled in red. Usually, the 10 MHz signal from a GPSDO is used as reference, and the rig derives all its other frequencies and timing from this extremely accurate 10 MHz signal. This will ensure that the rig is right on frequency. The IC-9700 can achieve frequency accuracy within 1 Hz!

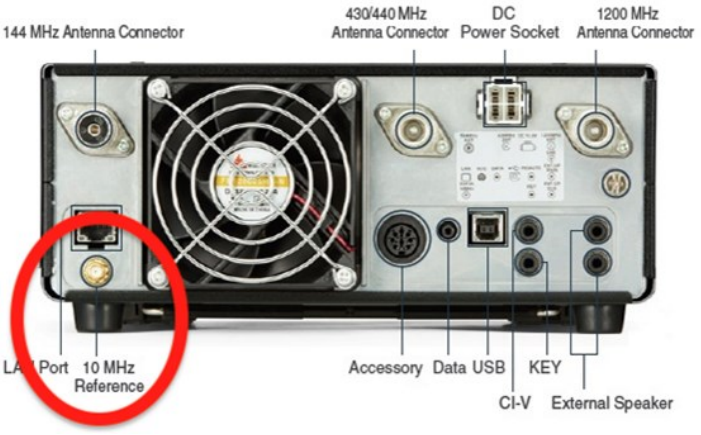


Figure 10 *[top right]* Rear Panel of the IC-9700

The reason I purchased a GPSDO is that I plan to do some EME operation on 1296 MHz in the 23 cm amateur band. EME on 23 cm uses the JT65 digital mode, and signals need to have very good accuracy. Hence my desire to use a GPSDO with my rig.

A decade ago, devices like GPSDOs cost on the order of US$20,000 to $30,000. In another miracle of modernization, miniaturization and digital signal processing, a low-end GPSDO can be purchased today for under US$100 [12]. These low-end devices that are not particularly accurate, although they perform like $20,000 devices of a decade ago. For about another US$100, one can purchase much more accurate GPSDOs from companies that specialize in this type of equipment.

I decided to purchase a higher-quality unit. I avoided the cheap-looking US$91 eBay devices and instead bought a "Mini Precision GPS Reference Clock" from a UK firm called "Leo Bodnar Electronics" [13] for 99 GBP, or about C$172. See Figure 11.

Figure 11—GPSDO Unit

This unit measures 5.5 x 4 cm and is powered by 5 VDC via a USB cable. It generates an accurate output signal at any user-selectable frequency from 400 Hz to 810 MHz. Accuracy is a few parts per billion. I set the output to 10 MHz and use this signal with the "Reference In" SMA jack on my IC-9700.

The company is very well known within the VHF/UHF amateur community, and also supplies lots of government agencies and research labs. I thought it better to purchase a unit from a company with some validated technical expertise and recognition in the field.

I tested the unit I received with the calibrated test equipment in my basement lab and found that its output was extremely accurate. In fact, the tiny differences I observed in frequency were likely due to inaccuracies in my test equipment, rather than in the GPSDO unit itself!

If you are looking for an extremely accurate frequency standard and have a newer rig with a "Reference In" jack, then you might want to consider adding a GPSDO device to your station.

Summary

That's it for this month! Feedback on this article can be directed to the Editor, or directly to me at mcquiggi@sfu.ca.

73,

~ Kevin VE7ZD / KN7Q

[Article references next page]

References

[1] Article on building a "coffee can" waveguide antenna: http://www.w1ghz.org/antbook/chap6-3.pdf

[2] https://en.wikipedia.org/wiki/Pickled_cucumber

[3] "Electromagnetics" by J.D.Kraus and K.R. Carver 1977, ISSN: 0002-9505. Details in section 13.16

[4] Readers may note that I am using the same high-tech test stand for the new 23 cm antenna as I used when testing my homebrew 2 metre long Yagi, as described in the March "Communicator".

[5] The probe or radiating element is essentially just a ¼ wave vertical antenna. An approximate length should be 23 cm divided by 4, or 5.75 cm – about 2.3 inches.

[6] The optimal length was slightly shorter than the equations predicted, about 1.9 inches. The difference is due to physical differences between the corrugated heating duct and a smooth-sided, perfect cylinder.

[7] https://gnuradio.org

[8] The receiver will be the subject of a future Radio Ramblings column.

[9] "The quick brown fox jumped over the lazy dog", a standard text for testing character-based transmission and reception. As the gnuradio "File Source" block will repeat the text over and over, the length of text in the file doesn't really matter at this stage. Eventually, I will change this block to allow the user to type characters which will be transmitted.

[10] "Bits to Hz" is not part of the standard gnuradio set of blocks, but I can make the block available to any reader who is interested in working on their own RTTY transmitter.

[11] I wrote the "Bits to Hz" block myself in Python and as such know that it's performance is much better than the earlier multiply/add process.

[12] Search GSPDO on https://ebay.com

[13] See http://www.leobodnar.com and http://www.leobodnar.com/shop/index.php?main_page=product_info&cPath=107&products_id=301

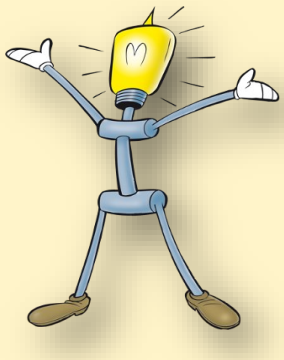
Deep 'Solar Minimum' is feared

Forbes Magazine

Although we have seen the re-appearance of some new solar cycle sunspots in the past month, Forbes magazine reports a deep 'Solar Minimum' is feared as 2020 sees a record-setting 100-day slump

Jamie Carter writes:

While we on Earth suffer from coronavirus, our star—the Sun—is having a lockdown all of its own. Spaceweather.com reports that already there have been 100 days in 2020 when our Sun has displayed zero sunspots.

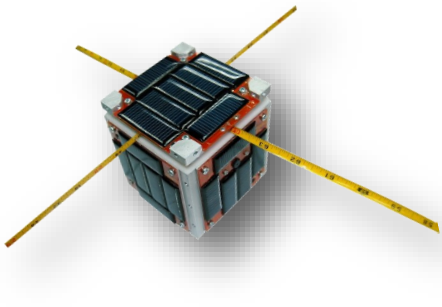


That makes 2020 the second consecutive year of a record-setting low number of sunspots

So are we in an eternal sunshine of the spotless kind?

Read the full article at

https://www.forbes.com/sites/jamiecartereurope/2020/05/12/the-sun-is-asleep-deep-solar-minimum-feared-as-2020-sees-record-setting-100-day-slump/



Satellite News

The Brand New SatNOGS Database

We are thrilled to announce the launching of the newly-redesigned and updated SatNOGS DB. We have put a lot of hard work into it and we are thrilled to present it to you.

A New UI for SatNOGS DB

The brand new SatNOGS DB focuses on providing an improved experience to users. It has a clearer and more efficient design, a more user-friendly interface and a more efficient and functional DB.

To start with, the design of the welcoming page has changed featuring three main fields. The first field is the New Satellites field. It contains the names of the latest satellite entries. The second field is the Latest Data and lists the names of the satellites receiving the latest data. The third field is the Recent Contributors field. It features the long list of the names of the contributors collecting data in the last 24 hours. Perched next to the names is the number of data frames they have contributed to the SatNOGS DB.

The Old SatNOGS DB

As with the old DB, the new SatNOGS DB sports an "All Satellites" tab from which you can navigate and scroll through the long list of satellites (400+) tracked by the network. A new feature added is the ability to see the status of a satellite. What is more, there is a recently-added "All Transmitters" tab listing all the transmitters (900+) in the network. This is a separate and distinct tab, under the "All Satellites" tab on the left of the screen.

For each satellite, there are dedicated views with additional information for the mission and its operational status.

There is also a Statistics tab. By clicking on it you can land on a page offering you a more spherical view of the numbers making up SatNOGS. Indicating the number of satellites, transmitters, data frames, About the SatNOGS DB

SatNOGS DB is an integral part of the SatNOGS project counting over 360+ satellite ground stations worldwide. It is an open-source, participatory initiative, fueled by the contributions and efforts of its devoted and diverse community of space enthusiasts, radio amateurs and satellite observers. SatNOGS DB is an attempt to create and maintain an up-to-date global Database of all artificial objects in space (of satellites and spacecrafts too). It is machine-readable and open to everyone who needs to have access to the data obtained. You can even connect your application to it using the available API.

This crowd-sourced, open-development and fully-transparent approach we apply to the SatNOGS project is a great example of how we operate and manage projects at the Libre Space Foundation. Everything we do adheres to the beliefs and the principles fueled by the Libre Space Manifesto. You can find out more about the Libre Space Manifesto and its principles and you can even show your support if you agree with it.

Care to join us?

If you have been intrigued by what you have read so far, have in mind that you can always join the SatNOGS project. Whether you are a space enthusiast wishing to build a SatNOGS ground station or you are fluent in Python and/or JS and you wish to contribute to the SaNOGS-DB web application. Everyone is welcome and you can start by reading how you can Get started with SatNOGS. You are also more than welcome to join our community forums and our riot/ matrix channels. Reach out to us and be part of our community. We would love to hear from you!

~

Daniel Romila VE7LCG

Daniel's Workbench

How to Automatically Create QSL Cards from an Excel Logbook

In a previous article *[The Communicator July-August 2020]*, I presented an article on "How To Make A QSL Card With Microsoft Word". The result of that step-by-step tutorial was a document file, having the extension .docx, which contained a single page. The page was defined there as 11 inches wide and 7.4 inches high. Those numbers (and also the fact they are in inches) do not matter much; what matters is:

- the ratio of those numbers, which is 0.672, and;
- the fact the page is rendered large enough to show details.

When we print this QSL card (or a bunch of QSL cards, if you can automatically input data from a logbook) we can eventually determine the scale. Please keep in mind if you want margins, or if the target printer requires your document to have margins.

Please modify the above width and height for your printed QSL card. In order to follow this tutorial and the previous tutorial please keep:

- one QSL card per page, whole page;
- the page orientation as landscape.

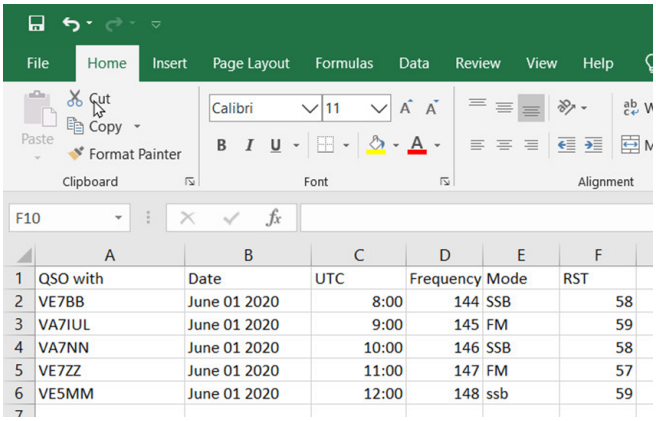
When we open the document containing the finished QSL card from the previous article, we will have on the screen what I opened on my editor as "the card.docx" *[image left]*.

We see that we have the following QSL card fields (not defined yet as Microsoft Word fields):

- QSO with
- Date
- UTC
- F (MHz)

- Mode
- RST

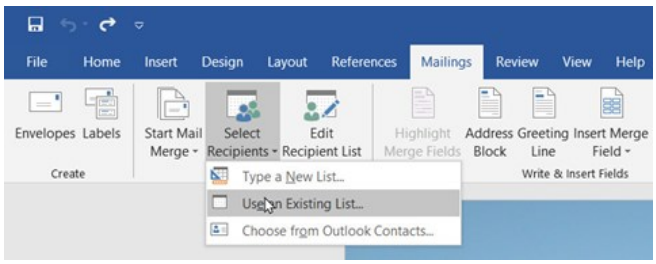
The automatic completion of the values of those fields will come from a logbook, in Excel format (or any ham radio program that can either generate an Excel sheet, or data that can be copied into an Excel sheet). I created a 'Logbook.xlsx' file, with headers and only 5 sets of data (5 QSOs), for the purpose of this tutorial, also attached to the editor.



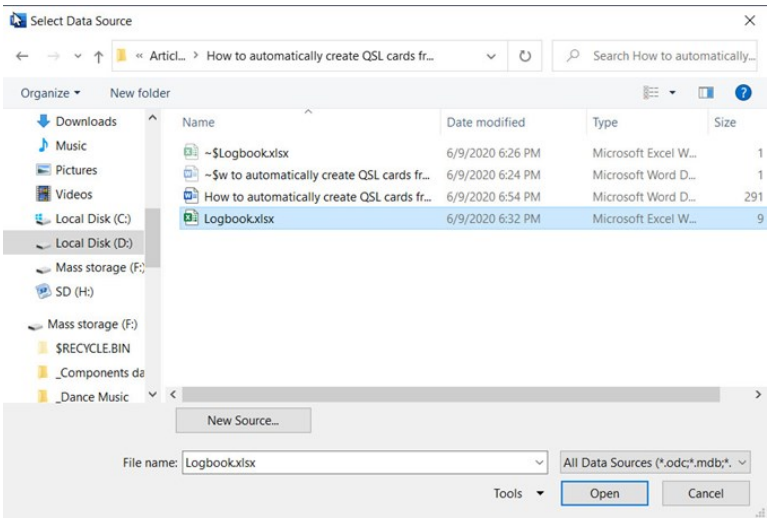
If you want more fields, with more information, you have to match the QSL card you create in Microsoft Word with your Microsoft Excel logbook (or whatever source you would use – in the end an Excel table results).

We come back into our .docx document, containing the QSL card. We will connect the Microsoft Word document with the .xlsx Microsoft Excel logbook.

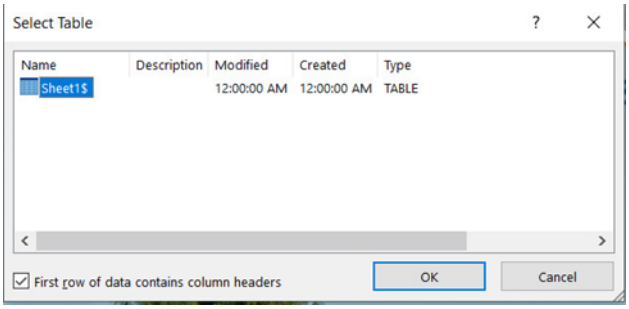
We will select from the tab upper bar "Mailings", and from there "Select recipients". From the drop down menu we select "Use an Existing List". Click on that.



A new window appears, allowing you to select your data source. Browse to your file, at your location, and select it. Mine is called Logbook.xlsx. Click "Open".



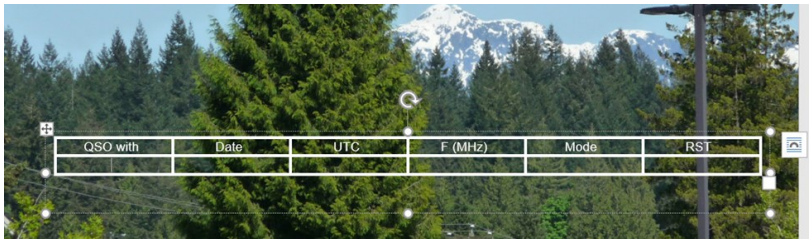
An Excel file might contain more tables, so you are asked which table you want to use. My logbook contains just one table, so I accept what is offered on the screen and click "OK".



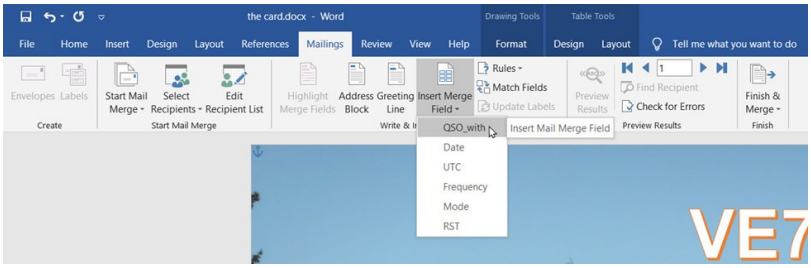
My QSL card already contains some QSO data in it.

I just delete it, to have free space for whatever fields I will automatically bring in from the logbook.

With the mouse left click in the cell under “QSO with”. The table also becomes selected.

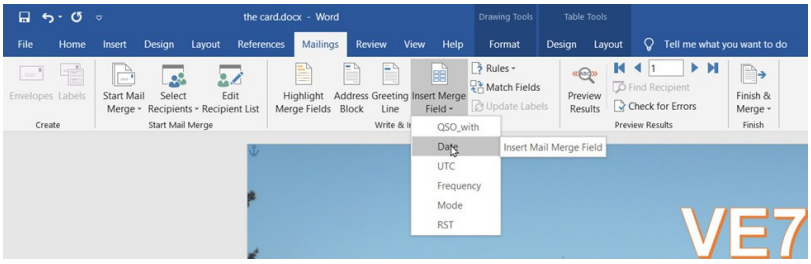


Now you can select which field to put under “QSO with” and, of course, the best is to put the corresponding field from your logbook. Click “Insert Merge Field” and from the drop down menu select “QSO with”.



The result of this operation can be seen in the QSL card: (<<*QSO_with*>>).

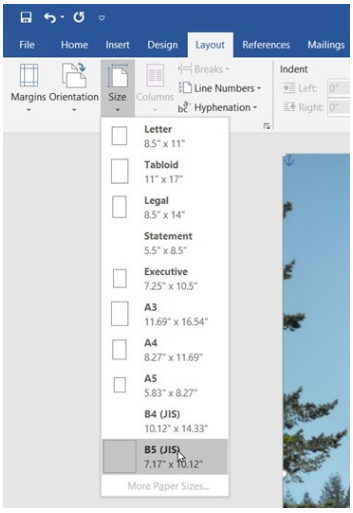
With the mouse left click under “Date”. Repeat the operation of inserting a merged field. That means click “Insert Merge Field”, and from the drop down menu this time choose “Date”.



Repeat for all the fields you want to merge. (Left click where you want to place the field, and insert it.). The QSL card will have at its bottom.

Due to a limitation in Microsoft Word, the final result will not look good if the size of the document is not something standard. I found this out only while writing this article, so let’s make the small correction now.

I want a single document, in pdf format, so let’s make our document as B5 size. Click “Layout” tab, and from the drop down menu select “B5”.



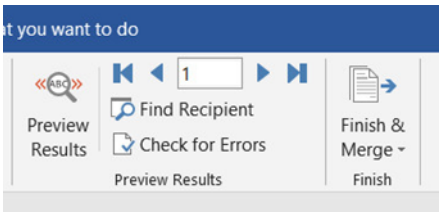
The QSL card readjusts to the new page size.

This is not good, because the callsign and the location are partly outside the QSL card. I drag and drop the 2 elements to the position I want by clicking in the element, walk the mouse at the extremities of the box until I see a cross *[as below]*, then I left click and keep the button pressed until I move the element into the desired position (= drag and drop operation):

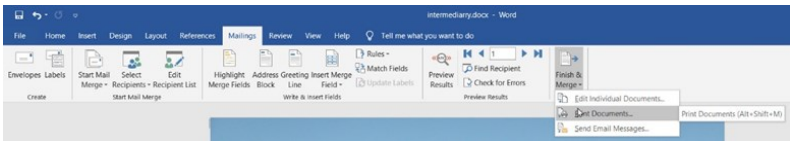
Sometimes it is frustrating because I want to drag and drop one element, and I actually apply the operation to another element, selected by mistake. I just UNDO and do it again, paying attention to select the proper element. And finally, I am back at a nice QSL card.

This is the file we will use again and again when we want to generate a bunch of QSL cards, according with whatever QSOs we want at that time. We will not have to repeat the previous work again and again. I attached the above to the editor as "the card with merged fields.docx". From here to the end of the article is what we will do each time we print a batch of cards.

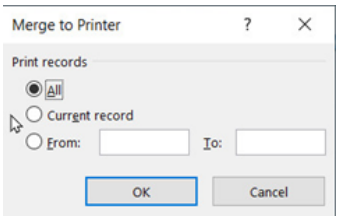
We can preview the result of the future merge operation, by using the buttons.



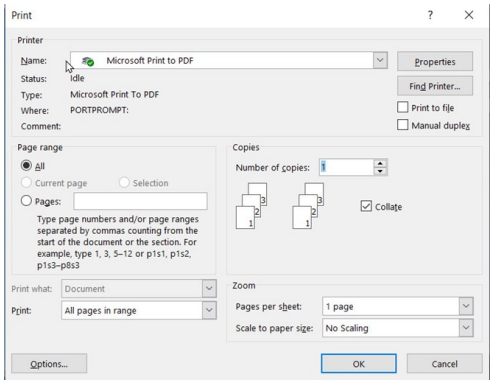
Let's click "Finish & Merge", and from the drop down menu "Print Documents".



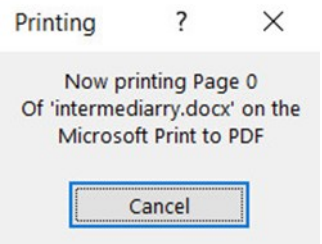
I want to print all produced QSL cards, so I select "All" from the dialog box:.



I will use the Microsoft Print to PDF as printer, no scaling, 1 sheet per page.

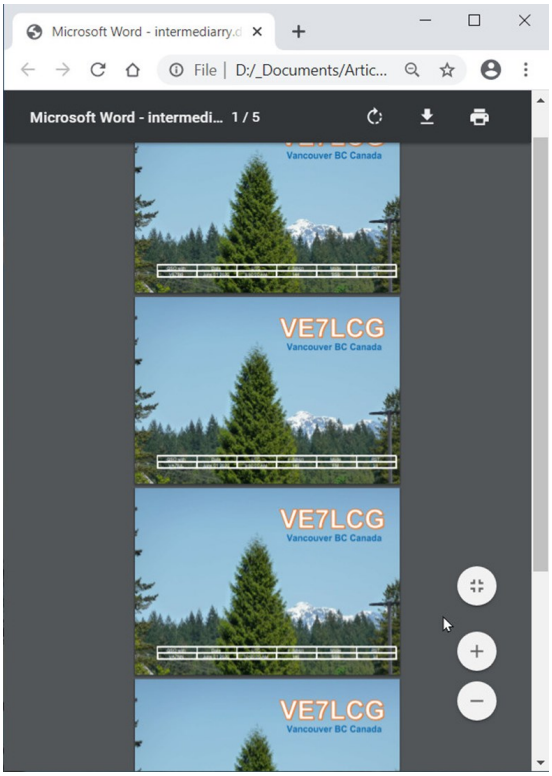


Next I am asked for a name for my 'printed on pdf' format file, and a location for it.



It will take several seconds for Microsoft Word to print into pdf format, and it will display the following message while printing to pdf *[image left]*.

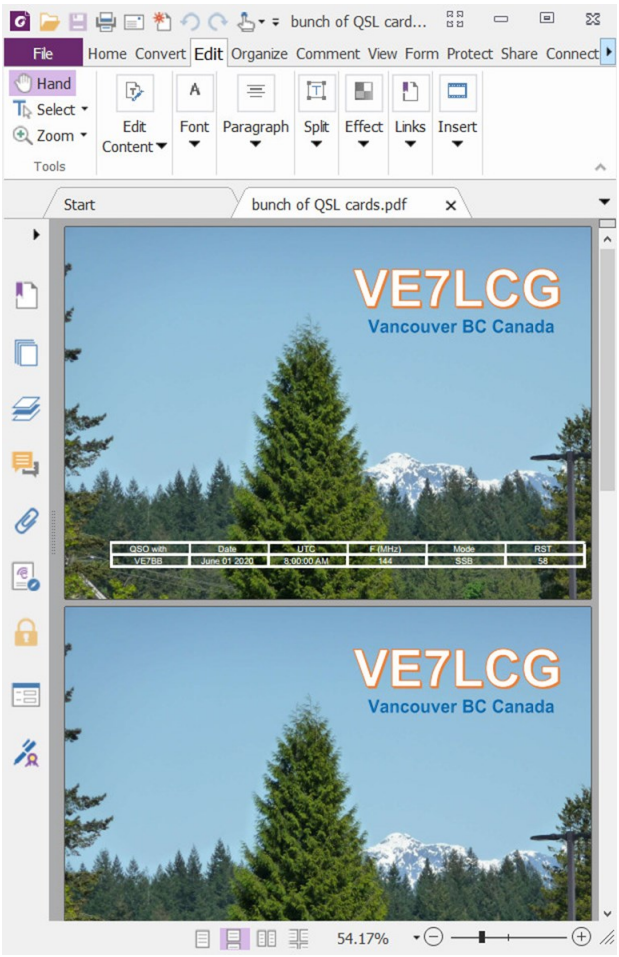
When I no longer have this message on the screen my pdf file is ready. I go in the location I selected for it, I double click and in my case it opens with Google Chrome, which is my default pdf file viewer.



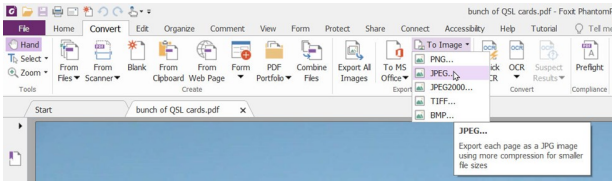
As you see, this pdf file contains all QSL cards I arranged in my design, with all the information I merged from the Excel Logbook file. Now I can print it on paper with a good color printer, paying attention to how I feed the paper into the printer.

But this article cannot end here because a reader of the previous article about designing a QSL card with Microsoft Word, asked how to generate a separate jpg file for each QSL card completed with the logbook information.

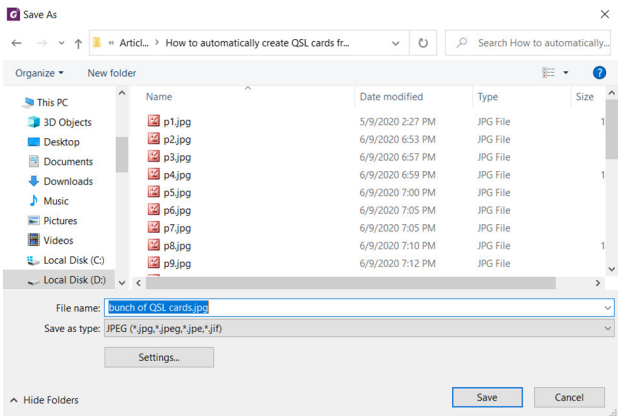
Microsoft Word does not know to split the document into a jpg image file for every single page, so I have to use another program. Any pdf editor would do. I am using Foxit PhantomPDF. Let's open the "bunch of QSL cards.pdf" in my pdf editor.



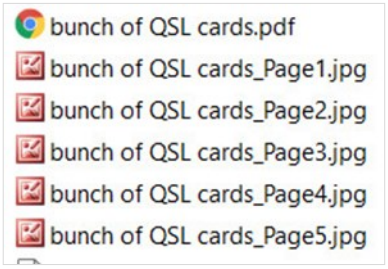
My editor has a simple convert to image option, that all pdf editors have. In my case it is.



I click to convert each page into a separate jpg file. I am asked to choose a location and name for these files (they will become numbered; the program automatically adds "*_Page1*", and so on at the end of the name) *[image top next page]*.



I click "Save" and after a while it is finished. Now I have all QSL cards in the selected folder, separated as jpg files, one jpg for each entry from the logbook. You can see in the screenshot below that they automatically became numbered.



I wrote this article while performing all these operations step-by-step, making screenshots and documenting as I went. If you also follow the described procedure step-by-step it will work for you as it worked for me.

Once you are comfortable with what I did and can reproduce it, you can venture to making changes and personalize.

~ Daniel VE7LCG

Editor's Note:

The International Amateur Radio Union and its member societies recommend a maximum size of 3½ by 5½ inches (140 mm by 90 mm) for QSL cards.

Paul Piovesan is now VE7DOG. Paul took his Basic course with SARC and has since moved to wine country. Nice card Paul!

What they need...

Transceivers need love
Transceivers need care
Show that you're made of
More than despair

When they have a problem
That needs to be fixed
You do not feel boredom
Technically mixed

With a lack of respect
For knowledge and skills
They need intellect
Not your sleeping pills.

Don't touch the buttons
To do something weird
Control your actions
The fault to be cleared.

~ Daniel VE7LCG

Daniel Romila VE7LCG

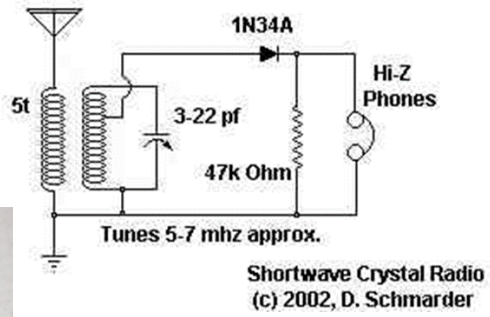
Daniel's Workbench

...continued

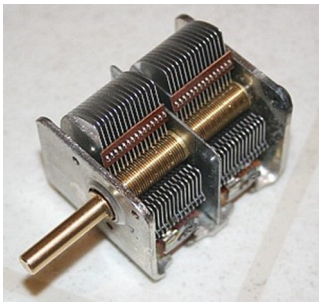
Variable Capacitors for Ham Radio Projects

Many beginner ham radio projects require just a few components. A crystal radio, for example, would be appropriate for a first-time builder ham radio enthusiast. Something like:

Coil: 1.6 inch o.d. 23awg Wire
Antenna: 5 turns
Detector: 30 turns tapped at 20turns.



Shortwave Crystal Radio
(c) 2002, D. Schmarder



All components are easy to buy, install and use, except for the variable capacitor. Ideally, an air variable capacitor would be recovered from an old analog radio.

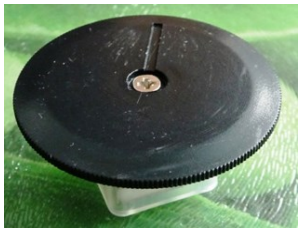
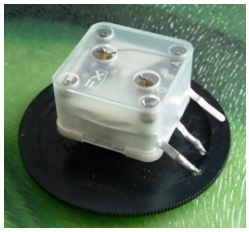
For quite a while these kinds of air variable capacitors are no longer used in commercial radios. The majority of radios today are digital, because mechanical parts are more expensive than integrated circuits. So a new radio amateur would have problems finding such an old classic part, and buying it for C$10 – 40. This is much more money than everything else on a crystal set, and even more expensive than a Baofeng 2 band walkie-talkie, which is around C$27. Not much incentive to spend money on building ham radio equipment.

Luckily, there are cheap plastic capacitors. For a little under CS1 (shipping and taxes included), the Chinese websites sell the model 223p, which is duplex, with the capacity variable between 60pF (this a declared value, not what I measured, 30-40 pF) and 140 pF. Duplex means that while one section increases the capacity, the other section will decrease the capacity. (Please see the end of this article for more "normal" variable capacitors.) This is not good for double tuned RF circuitry, and not good for a super heterodyne receiver, but good for other simple projects, requiring just a one section variable capacitor.

On the back of the capacitor there are 2 semi adjustable capacitors, most useful for dictating the lower end value of the variable capacitance.

From my experience there are big variations between the declared min and max capacitances listed by the seller and the real ones. Probably the manufacturers make different lots, with different characteristics, but they look the same, and sellers just put them together without separating them based on specifications.

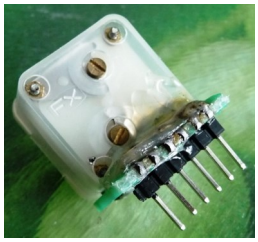
Something like the above component is not exactly user friendly for mounting on a homemade box. The 2 threaded mounting holes are 2.5 mm diameter. The central hole, for the adjusting knob is 2.1 mm. This is a non-standard value. 2.5 mm or 3 mm would have been easier for hobbyists. For several cents more one can buy the variable capacitor together with an adjusting wheel and its dedicated screw.

When the adjusting wheel is screwed on, the mounting holes and screws are no longer accessible. Those variable capacitors are definitely meant to be put on a PCB, not on a chassis.

Of course, this article was written from my own frustration, and I could not leave things as they were; I used the old technical advice, about using a bigger hammer.

Because I do many projects on breadboards, I mounted the variable capacitor on a small PCB, surrounded in molded plastic, and soldered it to some father connectors.



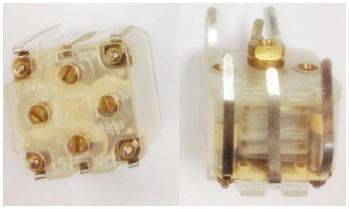

The above mounting is solid and solved the mounting problem. In order to use normal knobs I had to extend from the 2.1 mm central hole. I used a 2.5 mm threaded plastic spacer. Because it is plastic, it mounts into the 2.1mm hole with some applied pressure. The profile of those spacers are hexagonal, which are just a bit big for the normal knobs, and I had to do a small adjustment with a knife. The final assembly is shown on the right. The assembly is much more usable as a variable capacitor but required work.


I found specially made shafts for plastic capacitors, homemade and sold online. They are between C$6 and 10 each (!!!) for a C$1 variable capacitor. Not for me.

The Chinese websites also have a wild crop of plastic spacers and knobs *[right]*.

Model: MF-A01 Diameter: 20mm High: 12mm Inside Diameter: 6mm
Model: MF-A02 Diameter: 23mm High: 13mm Inside Diameter: 6mm
Model: MF-A03 Diameter: 28mm High: 15mm Inside Diameter: 6mm
Model: MF-A04 Diameter: 33mm High: 16mm Inside Diameter: 6mm
Model: MF-A05 Diameter: 45mm High: 20mm Inside Diameter: 6mm

Everything described above for the 223p variable capacitor is also valid for the real 443 DF double variable capacitor. This model has two sections simultaneously variable from 20 pF to 140 pF, and even 2 additional sections adjustable from under 1 pF towards 20 pF. This variable capacitor has 6 terminals, and also the 2.1 mm threaded hole in the middle *[right]*.



What I would like to underline here is that the min and max values of such plastic capacitors are not the same values as the old air capacitors, used in older analog books with schematics for radio amateurs. A schematic meant for a 350 pF or 500 pF variable capacitor must be modified in order to work with a 140 – 150 pF variable capacitor.

It is easier to put together an Arduino board with a digital radio module for making a radio today, than to put together a simple crystal radio set. But this is in no way a deterrent for me to continue to build analog radios.

~ Daniel VE7LCG

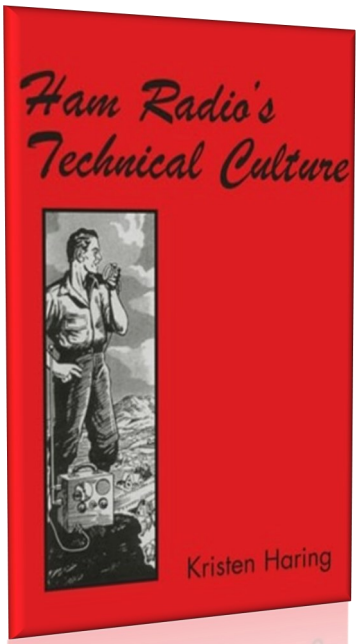
Daniel Romila VE7LCG

Daniel's Workbench

...continued

Ham Culture in Movies and Songs

After ham radio is extinct, researchers will still be able to find out about radio amateurs through whatever there will be left as a cultural thing. I intentionally used the term "Ham Culture", which I could not find used anywhere up to now. Maybe my legacy in the history of adult and higher education will not be through my Ph.D. studies in Education, not through the research papers I published, but only through this article, published in a ham radio magazine.



I found the term "Ham Radio's Technical Culture" in many places, which is a more limiting term, referring mostly to the technical aspect. In 2006 Kristen Haring wrote a book with this name, which can be viewed and bought at: *https://mitpress.mit.edu/books/ham-radios-technical-culture*

By "ham culture" I want to address not only the technological advances that were made based on ham radio experiments, but also the community and general social aspects involving the hobby, even including the relations and disputes that our hobby generates with neighbors, spouses and relatives. While for us, certified ham radio people, there is a clear distinction between classic CB (around 27 MHz) and ham radio, I do not think that the general public knows any difference between the two of them, neither now, nor when whatever will be left of ham radio as community emergency services and a new kind of citizen band(s), spread on several bands and most probably also spread on several satellites.

While I grew up directly into ham radio because in the country where I am from CB was illegal, CB has the clear advantage of instant gratification; one can see it used by someone else, decide to buy it and get active on it. A CB radio can be bought without any license, without any exam, and put into operation right away. It is simple to operate.

A ham radio transceiver requires license, that means exams preparation and exams. One has to be technologically savvy enough to operate it. It can even be scary for a beginner.

There is also a huge difference in price. So I am launching the idea that "ham culture" will be remembered as being in fact the CB culture, or at least to incorporate it, and a big part of the ham culture to actually be about CB radios.

While there are many movies in which ham radio appears and ham radio gets some action, the only movie that I know of that it is centrally based on

ham radio communication is “Frequency”, a science fiction thriller written by Toby Emmerich and directed by Gregory Hoblit, released on April 28, 2000.

The science-fiction movie is about a father and son speaking through ham radio equipment by somehow breaking a 30 year difference in time. The son is in 1999, and talks to his father who is already dead, living in 1969 (https://www.youtube.com/watch?v=jdACpDDplUs).

CB radio was generally presented in movies as the communication tool between truck drivers. The truck driver was a kind of favourite hero in the 1970s – 1980s but faded away after that. In 1978 the movie called “Convoy” was released. It is a movie completely based on a single country song, also called “Convoy”, written by C. W. McCall, in 1975.

Above is C. W. McCall, from his videoclip that can be seen at: https://www.youtube.com/watch?v=FlxUp4RY5Ps

In the movie (as in the song) a truck driver with the call name “Rubber Duck” gets in trouble with a dirty cop. Through the CB, truck drivers communicate and come across Arizona and New Mexico to help Rubber Duck.

The trailer of this movie can be seen at: https://www.youtube.com/watch?v=uDUXvR79wS4

The song was also used in GTA V (Grand Theft Auto 5 video game):

https://www.youtube.com/watch?v=Dnt5zeiW1Rs

One country song, “Convoy”, made so much publicity for CB, it remains in history. It is difficult for ham radio to compete with such glory.

While it is a big temptation to write about ham radio communities and social aspects, and eventually to build on the experiential learning model of David A. Kolb, I want this article to be only about movies, videos and songs that will give ham culture a place in history. Once it is digital, it is there to stay.

Country music was also used to promote ham radio. The song “Join Us On the Airwaves”, by Andrew Huddleston (from The Ham Band)

can be seen at: https://www.youtube.com/watch?v=52NGdr1QE7k

The singer wears a kind of 1920 – 1940 jazz/Charleston outfit, while singing country music. Initially I had doubts about mentioning this song because of some unclear words in the lyrics, but it really seems to be a good-hearted song. I quote:

"You're looking for adventure?

Well, you could become a ham.

Come and join us on the airwaves

Surf the skies and find new friends

Let the world unfold before you

You'll be the one who sets the trends."

Some songs go more for a jazzy style than the country style. The song "Ham Radio Hoarder" describes a YL who has relations with men just to steal their ham radio equipment from them: https://www.youtube.com/watch?v=OidowSpbxJo

Andrea Vadrucci (Vadrum) modified the song "Morse Code Music" made by VE1VAC into a drum session:

https://www.youtube.com/watch?v=6XHwygN9CKM&list=PLfZnJfwRdrxyxPlDc7Xvbp2fWL5GlU13q&index=6

If this is not "metal" enough for you, there is a metal song at: https://www.youtube.com/watch?v=qaHgdFH3jgs

If none of the above resonated with you, maybe a blues? "Ham Radio Blues" is a track from the album "When The Wolves Go Blind". https://www.youtube.com/watch?v=nzKpoX1QfZw&list=PLfZnJfwRdrxyxPlDc7Xvbp2fWL5GlU13q&index=13 *[photo top right].*

Some people use ham radio songs even when they get married. I mention it here because it is also different than all the above songs, being a ham radio rap. https://www.youtube.com/watch?v=01g3nXeSsPk

But there is nothing new under the sun. Ham radio songs date back to at least 1960. One souvenir of May 7th, 1960, the Dayton Hamvention, is Joyce Hahn and the VE2QS orchestra recording of "CQ Serenade": https://www.youtube.com/watch?v=lOqe0oouN2s

It seems the song covers a previous French Quebec version.

Somehow, finding all those ham radio song videos on the Internet makes me feel safe that ham culture will not be remembered only as CB radio. I am sure there are many others. The zombie mode (FT8) and many other gizmos do not encourage me much about future generations remembering that ham radio was something other than CB.

~ Daniel VE7LCG

Editor's Note: *In an email exchange with Daniel I told him of some earlier mentions of Ham Radio in the media. The Twilight Zone was on CBS-TV between 1959 and 1964. Daniel was born in 1965! He says that the Twilight Zone TV series that he knows of is a different one, a remake from 2019. Daniel wrote that there was also the TV series called "The X-Files" (1993 - 2018), which on Serbian TV was translated with the title Zona Sumraka (which is Twilight Zone). https://www.youtube.com/watch?v=MyaAqcGj7w0*

In the SARC Basic course we have used clips from various TV series. Not only The Twilight Zone, which provided us with several including "Black Leather Jackets" and "The Monsters Are Due On Maple Street", but also The Munsters and an old Andy Griffith movie "No Time For Sergeants". Each has a Radio subject and you can find the clips with a YouTube search.

SARC has also contributed to the collection… see "That's How Field Day Goes" from 2014 at https://www.youtube.com/watch?v=F8lFIVGli_Q&t=4s

~John

Twilight Zone: The Monsters Are Due On Maple Street

Twilight Zone: Black Leather Jackets

The Munsters

No Time For Sergeants

New Trans Canada Net on Linked Repeaters via ALL Star & IRLP

If you have been a Canadian Ham since the 1990's you will probably not only remember, but actually played on the IPARN (Inter-Provincial Amateur Radio Network) System. In those days a very technical adventure involving relays via the Anik E-2 satellite and ground stations has now been replaced with less than of $100 of inexpensive Raspberry Pi's and connecting cables.

North Fraser ARC, sponsor of the Canada Hub on the All Star Network, which is now linked to IRLP as well, is pleased to announce the establishment of a weekly Trans-Canada Net which will be linked Coast to Coast from Newfoundland & Labrador to British Columbia. We will have almost all Provinces connected every Sunday and we are working on the Territories as well. All Radio Amateurs welcome, you don't have to be Canadian!

Trans Canada Net - All Star Canada Hub 51730, IRLP Reflector 9029

Sundays at 10AM Pacific or 5PM UTC

For a Bubble Chart of all currently connected repeaters CLICK HERE

For a list of All Star Nodes you can listen to and connect up CLICK HERE

~ VE7NFR

Daniel Romila VE7LCG

Daniel's Workbench

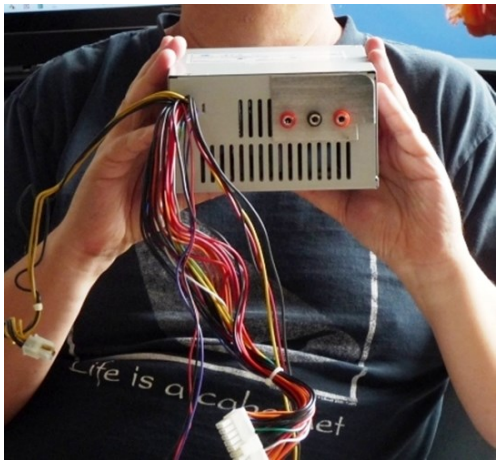
...continued

Partial Modification Of A Computer Power Supply

There are many good articles on the Internet about modifying a computer power supply for hobby amateur use. Usually those modifications get rid of the long annoying cables coming out of the power source. (In a computer those cables need to be long enough to get to the drives, motherboard and other components spread through the computer case.) An exhaustive and excellent article is at:

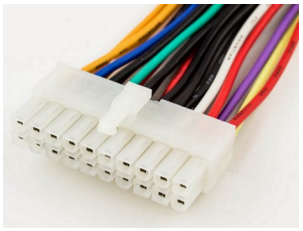
https://www.instructables.com/id/A-Makers-Guide-to-ATX-Power-Supplies/

My article is about modifying a computer power source to be able to use 5 V and 12 V for hobby projects, but also keeping the computer power supply useful for testing computer components. My final project looks like this:

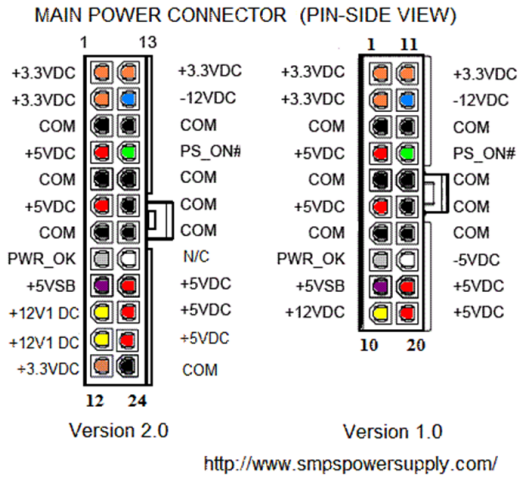


The first impression on seeing this picture is that I just added some mother connectors for banana jacks for 5 V and 12 V. Unfortunately, the internal schematics and wiring, meant for internal computer use, required some additional modifications.

Not all computer power supplies are the same. More than that, More likely is that you will modify an older power supply, which has more wires than those in use today. Almost every week I can find at least one old Intel Pentium era computer next to the garbage bin. They have ATX power supplies. Connecting a power cable to the back and switching the power switch ON will apparently do nothing, and this is the normal behavior. But let's look first at all the possible wires that can be in the ATX connector (usually that white big one, which goes to the motherboard. But I have also seen it in black color).



There are ATX connectors with 20 and with 24 pins:



I took the table from the aforementioned article

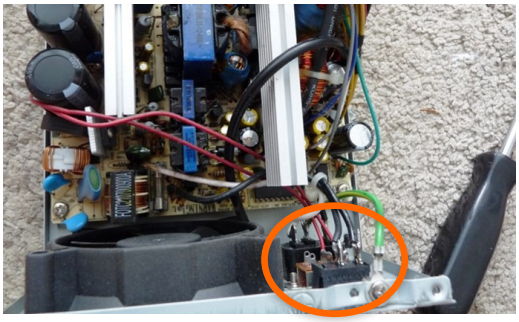
https://www.instructables.com/id/A-Makers-Guide-to-ATX-Power-Supplies/

The only way to put the power supply in operation is to short the black wire with the green wire, and to keep it shorted all the time we want to use the power supply. In order to do that I removed the original wires to the back switch, permanently soldered and isolated them, and re-soldered the internal green and black wires to the back switch.

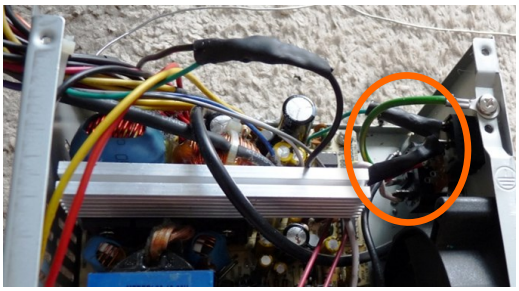
Color	Purpose	Notes
Black	0 V (Ground)	Often notated as "COM" for "common"
Orange	+3.3 V	Provides the stated voltage
Red	+5 V	Provides the stated voltage
Yellow	+12 V	Provides the stated voltage
Yellow with a black stripe	+12 V (2nd rail)	Present on newer PSUs; running to a separate 4-pin connector for the processor.
White	-5 V	Not present in newer PSUs. Provides the stated voltage, usually at very low maximum amperage.
Blue	-12 V	Provides the stated voltage, usually at very low maximum amperage.
Brown (or smaller-gauge orange)	+3.3V sense	Often present. Must be connected to the orange (+3.3V) wires to allow the PSU to detect and regulate output.*
Pink (or smaller-gauge red)	+5V sense	Sometimes present. Must be connected to the red (+5V) wires to allow the PSU to detect and regulate output.*
Yellow (small gauge)	+12V sense	Rarely present. Must be connected to the yellow (+12V) wires to allow the PSU to detect and regulate output.*
Green	PSU on	Connecting this wire to the black (ground) wire will pull the green wire's +5V signal low, signaling the PSU to turn on. If you want an on/off switch, it should be on this connection.
Grey	Power Good (self-test OK)	This wire sends a +5V signal as long as the PSU is providing power within normal parameters. Can be used to power an LED indicator to show that the unit is functioning properly.
Purple	+5V standby	Provides +5V whenever the PSU is powered (even when the green "PSU on" wire is not connected to ground). Can be used to power an indicator LED to show that the unit has power.

* Some PSUs will still function with the sense wires disconnected, however voltage regulation at higher amperages is likely to be negatively effected.

In my power source there were two black thick wires connected to the switch, which was on the upper side, next to the fan:



After modification:

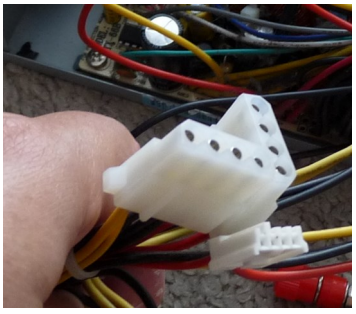


I verified my modification and, moving the back switch into the ON position, started the fan (and the power supply). That was the major modification I did, and soldering these thick wires require a good solid 100 W - 150 W soldering gun.

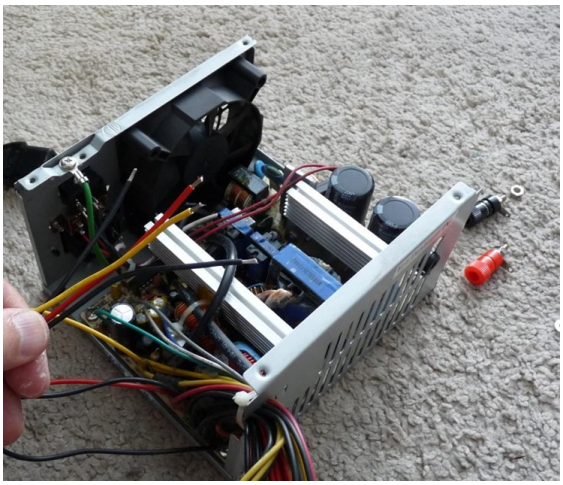
The next modification was to open the case and put 3 mother connectors, for GND (ground), +5V and +12V. I considered it sufficient to have easy access to those voltages, and not everything that the power supply is capable of. I repeat that there are articles on the Internet which totally modify the power supply and provide connectors for all possible generated voltages.

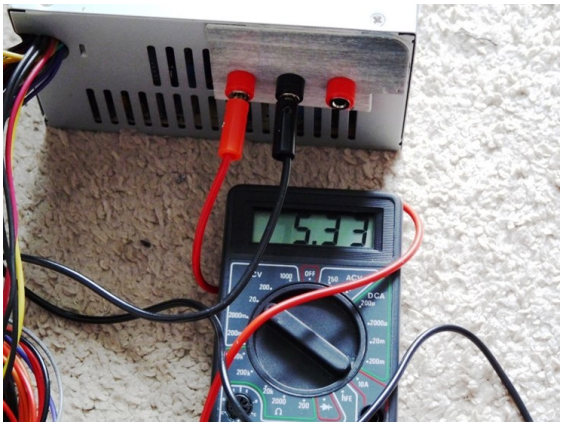
Opening made in the case

I installed the mother connectors on a piece of plastic and glued it on the case



In order to solder the required wires to the mother connectors I sacrificed a group of wires which were meant to power one of the hard drives or CD units.



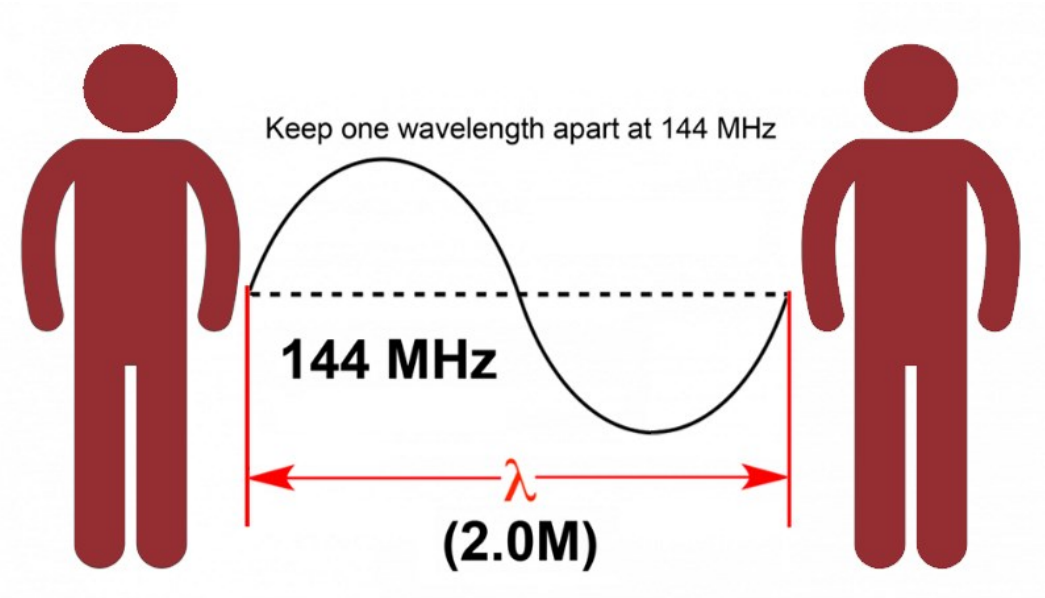


After soldering everything and putting the metallic cover back I was ready to test what I did. I obtained 5.33V (no load) and 12.99V (no load). I expect those values to remain stable even with loads requiring several amps. Computer power supplies do not generate exactly 5.00V and 12.00V, so the obtained values are normal.

As you see from the picture *[lower left]*, I still have plenty of cables with their original computer connectors to test computer motherboards and other computer components if I need to.

On the Internet I saw articles in which the authors modified the 12V to 13.8V by cutting and modifying the internal PCB. Some of these mods did not look safe to me, and all of them were difficult to do. Please always remember that soldering inside these power supplies requires big power and a lot of patience; very different than the work style we generally have for soldering a transistor or integrated circuit on a PCB.

~ Daniel VE7LCG



Daniel Romila VE7LCG

Daniel's Workbench

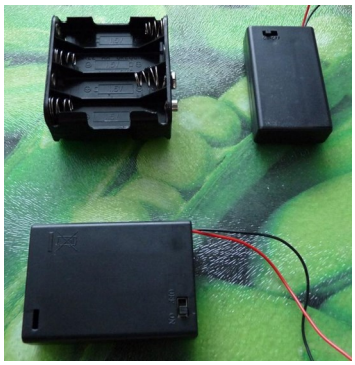
...continued

DC to DC Converters

The majority of ham radio equipment can have power supplied from rechargeable batteries either directly or with adapters suitable for a specific piece of equipment. 13.8 Volt batteries may look like a standard option, since many transceivers require a 12 V power supply (12 V means 13.8 V for maximum characteristics). But there are many other voltages required, for example for walkie-talkies *[right]*.

One might have already invested in a good power bank (5 V), and want to extend its use *[left]*.

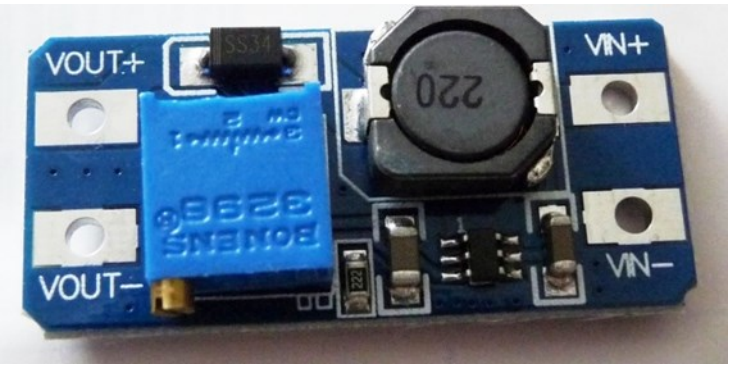
There are many other alternatives that a ham eventually gathers in his/her possession, and basic NiMh rechargeable batteries are at around 1.25 V voltage *[right]*.



It is possible to buy battery holders, for multiple 1.25 V cells by combining individual batteries together. Nowadays these can even provide 2,500 mA *[left]*.

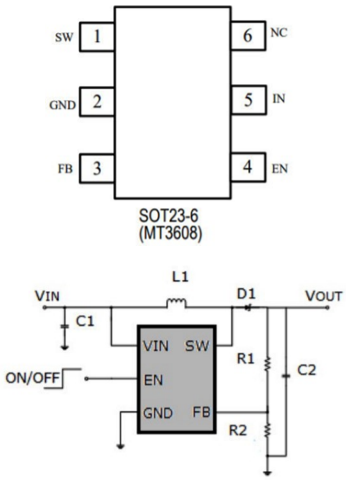
Of course, this is not a universal solution for obtaining the power source required for so many ham radio devices which can have individual requirements. Because the need of transforming DC to DC is so great there are manufacturers that designed such modules, and some of them are expensive, because they know to transform from 5 V into an output between 0.6 Volts and 30 Volts (for example XY-UDP): *[right]*.

The solution presented above is expensive. It can do a lot, but it is restricted to a 5 V input. Sometimes better suited DC to DC adapters can be obtained for less than one Canadian dollar (which right now is 35% less than one US dollar). For example, in June 2020 I successfully used the MT3608 module, which I bought from the Chinese websites for C$0.59 CAD (US$0.49 USD = 0.38 EURO) shipping and taxes included.



The maximum output current is 2A. The required input voltage is 2 V - 24 V for an output voltage of 5V - 28 V. The efficiency is better than 93%, up to 96%. That means that if I use the module for an output of 28 V and 2 A (for example for a final RF amplifier) I can have 56 W power supplied, from an input of around 60 W. The loss of power is 4 W or less.

The switching frequency is 1.2 MHz, the output ripple is less than 100 mV, the load regulation is +-0.5% and the voltage regulation factor also +-0.5%. Not bad for under one Canadian dollar, isn't it? The size of the board is 37.2 mm X 17.2 mm X 14.0 mm and it weighs 5 grams.

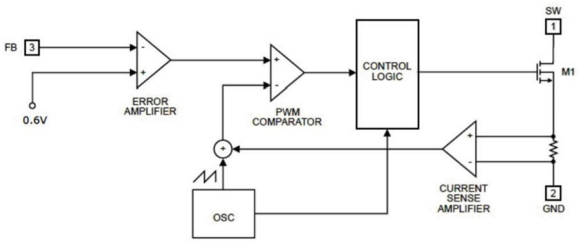


The basic schematic of this circuit

At the heart of the module is an integrated circuit MT3608, made by Aerosemi Technology Co., Ltd. The datasheet can be found at:

https://datasheetspdf.com/pdf/909246/AEROSEMI/MT3608/1

It is a classic switching power supply. More can be understood by taking into consideration the internal architecture *[right]*.



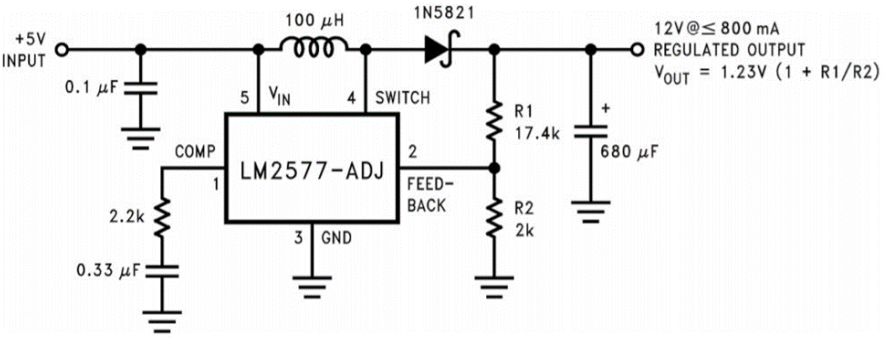
The internal switching current must be less than 4 A. It works in Pulse Frequency Modulation Mode, at a fixed 1.2 MHz frequency. I forced the module at 2 A and it works, but it becomes hot.

Texas Instruments makes the better known LM1577 and LM2577 integrated circuits. Those are just a bit more "heavy-duty". For an input voltage between 3.5 V and 40 V the output voltage can be from an undeclared minimum up to 60 V, at an output current of maximum 3 A. That is max 180 W out. LM2577 comes in various capsules, for different powers. The comprehensive datasheet can be found at: https://www.ti.com/lit/ds/symlink/lm2577.pdf

From there, the typical schematic:

The switching frequency is around 52 KHz, in comparison with MT3608 which works at 1.2 MHz. A ready-made module with LM2577, on the same website, is available at the same price with the module based on MT3608, both of them at max 2 A output.

For around C$0.85 you can buy these DC to DC modules based on XL6009, having a maximum output current of 4 A, double the previous modules. One should notice here that doubling the power current did not double the price.



The input voltage is between 3V~32V, the output voltage is between 5 V and 40 V, max 4 A output, at a switching frequency of 400 kHz. The board measures 43mm X 21mm X 14mm. The integrated circuit is made by KylinChip Electronic and the datasheet can be found at:

https://www.haoyuelectronics.com/Attachment/XL6009/XL6009-DC-DC-Converter-Datasheet.pdf

There are many other integrated circuits and ready-made DC to DC converter modules that can be used in ham radio equipment. I would not end this article before mentioning LTC3780, an integrated circuit made by Analog Devices.

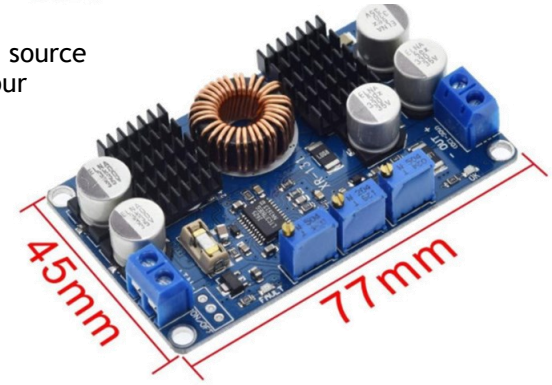
The datasheet can be found at:

https://www.analog.com/media/en/technical-documentation/data-sheets/LTC3780.pdf

The practical application is more complicated and it requires more external devices. Modules having maximum 10 A can be bought for around C$15 (US$11.39 = €9.59).

The point of this article is that today there are very cheap DC to DC modules available, small and powerful, which can be used for portable operation using whatever rechargeable block of batteries you might have. It is also possible to continuously use such modules at home – a kind of uninterruptable power supply.

For example: having a power supply charging the batteries from a DC source and not directly from the wall power supply to provide power to your transceiver or other equipment. This is useful if you expect electric power cuts and emergency situations, or if your equipment is dedicated to emergency communications and must be operational, whether the electric grid is functional or not.



~ Daniel VE7LCG

Daniel Romila VE7LCG

Daniel's Workbench

...continued

Recovering Components and Ideas from Old FM SCA Radios

Note: While this article started with a radio I found at the garbage bin, it contains general information about recovering components from various radios, specifications, tables and diagrams of easy to find used components, crystals, ceramic filters, integrated circuits, inductors, converters, demodulators, and FM amplifiers. **An SCA FM receiver already has almost all the required components on board to become a double conversion superheterodyne narrow band FM ham radio receiver but it requires the replacement of a 522 KHz resonator with a 10.245 MHz crystal, and a PCB modification for collecting the 10.7 MHz intermediate frequency signal into the second conversion stage.**

Passing next to the garbage bin with an eye open to gifts and challenges, I found this *[photo lower left].*

There was also a power cable connected directly into the portable radio. I immediately thought about an older kind of power transformer and a round speaker. Something was a little odd, because there was no tuning… it looked like somebody used a plastic box from a radio to make a custom radio. I plugged into the wall outlet and I heard nothing.

My conscience is now very clean.

Recovering components is not a sin

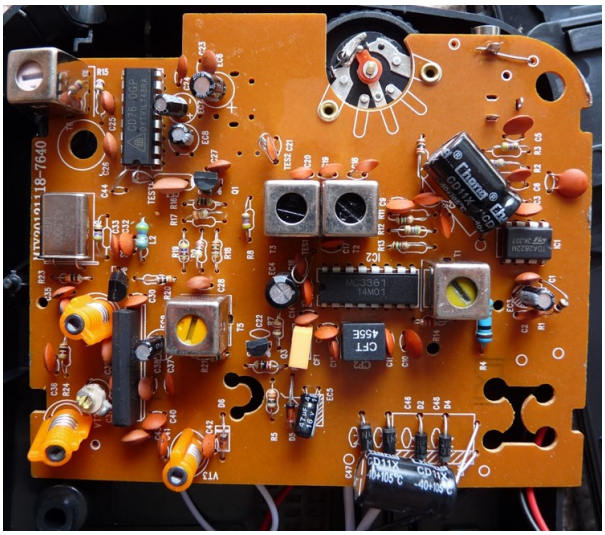
And I keep mother planet green.

I went into my apartment and, like a good surgeon, I prepared the screwdrivers, and I kept a hammer nearby, just in case.

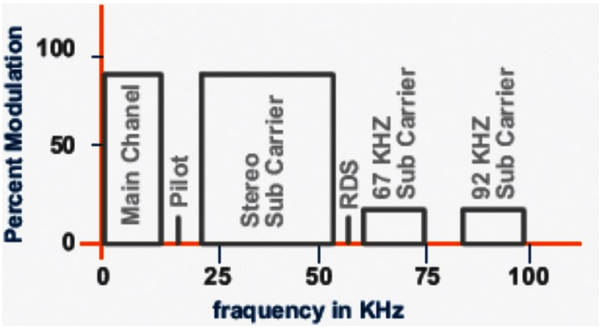
I again plugged the radio into a power outlet and this time I heard a hiss. I extended the telescopic antenna, and I heard Radio Fiji Mirchi loud and clear. It sounded typically FM. Fiji is a little far away from Vancouver, so I became suspicious. I turned the radio to the back, and it all became clear *[photo below right].*

On the back was a label "Made in China", and I learned it is an SCA crystal controlled receiver, for only one frequency (one broadcasting). It is custom made for Radio Fiji Mirchi – The Rhythm of Fiji, and a Vancouver phone number is also on the label.

For those of you who already have an inkling what this is about, here is how the PCB looks inside:



It is an SCA dedicated radio, for the subcarrier frequency of 67 KHz , piggybacking CBC Radio, the French one, "Ici Musique", which broadcasts on 97.7 MHz.



The above chart is adapted from http://www.radiosca.com/technical.htm which gives more info about the use of such subcarriers in FM transmissions. It is more a thing of the past. SCA means Subsidiary Communications Authority and it is a name mostly used in USA, while in Canada it is known as SCMO (Subsidiary Communications Multiplex Operations). It was used to send continuous music without advertising to stores, based on subscription. It is still used in Canada for blind persons' services (like book reading) and for ethnic broadcasts, like this Radio Fiji Mirchi in the Vancouver area.

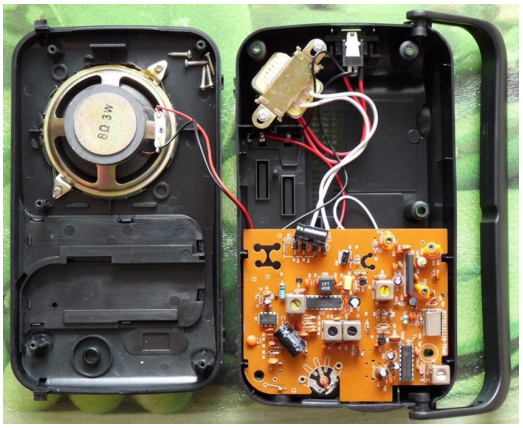
It is described at: https://www.fcc.gov/media/radio/subcarriers-sca#:~:text=FM&text=A%20subcarrier%2C%20known%20also%20as,signal%20over%20a%20broadcast%20station.

"A subcarrier, known also as Subsidiary Communications Authority or SCA, is a separate audio or data channel that is transmitted along with the main audio signal over a broadcast station. These subcarrier channels are not receivable with a regular radio; special receivers are required."

More theoretical information can be found at: https://www.compolinc.com/sca_technology.htm

and in the article "Subcarriers and Broadcast FM Radio" written by Kevin McQuiggin VE7ZD/K7MCQ in "The Communicator" from June 2019, on page 25: http://bit.ly/SARC19-06

But my article is about ham radio, and what we can reuse (scavenge) and learn from such FM SCA radios. So, opening the radio, this is what I found.



A ham would immediately notice that there are some parts that can be expensive to buy if one decides to buy them new, because of shipping fees.

- A classic power transformer. I verified that it does not heat and is silent.
- A decent 3W 8 ohm speaker, and its mounting screws and plates, and
- A telescopic antenna

Also, immediately visible there are:

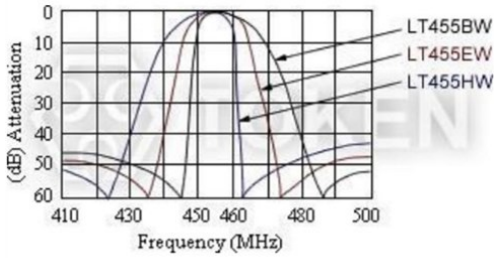
- 3 inductors on plastic supports, with silvered wire and ferrites working at a hundred MHz, and the trimmer capacitors, easy to unsolder.
- A 43.5MHz quartz crystal. It was used at double this frequency (=87 MHz, immediately under the commercial FM band. The resulting signal was extracted from the broadcast frequency 97.7 MHz – "Ici Musique" – in order to obtain the 10.7 MHz intermediate frequency).
- A 3-pin10.7 MHz ceramic filter. It is a wider type than 200 KHz, so not of much use for ham radio.
- A 3-pin 455 KHz ceramic filter, CFT455E. This is of limited use in ham radio, because it has a 15 KHz bandwidth. It is equivalent to LT455EU.

Just for a quick reference, here are the specifications of this family of ceramic filters.

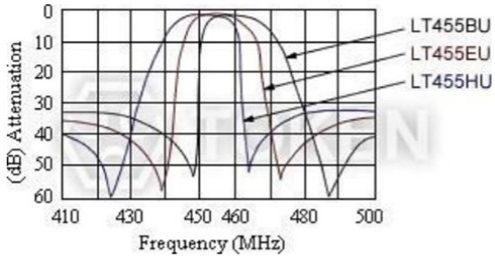
Part Number		Center Frequency (kHz)	Insertion Loss (dB) max	Pass Band Ripple (dB) max	6dB Band Width (kHz) min	40dB Band Width (kHz) max (LT455 U)	50dB Band Width (kHz) max (LT455 W)	Spurious Attenuation fo±100kHz (dB) min		Input / Output Impedance (Ω)
								(LT455 U)	(LT455 W)	
LT455AU	LT455AW	455±2.0	4	2	±17.5	±40	±35	28	40	1000
LT455BU	LT455BW	455±2.0	4	2	±15	±30	±30	28	40	1500
LT455CU	LT455CW	455±2.0	4	2	±12.5	±24	±24	28	40	1500
LT455DU	LT455DW	455±1.5	4	2	±10	±20	±20	28	40	1500
LT455EU	LT455EW	455±1.5	6	2	±7.5	±15	±15	28	40	1500
LT455FU	LT455FW	455±1.5	6	2	±6	±12.5	±12.5	28	40	2000
LT455GU	LT455GW	455±1.5	6	2	±4.5	±10	±10	28	40	2000
LT455HU	LT455HW	455±1.0	6	2	±3	±9	±9	28	40	2000
LT455IU	LT455IW	455±1.0	6	2	±2	±7.5	±7.5	28	40	2000
LT455HTU	LT455HTW	455±1.0	6	2	±3	±9	±9	35	60	2000

I took it from the official datasheet at: https://html.alldatasheet.es/html-pdf/342717/TOKEN/LT455IW/150/1/LT455IW.html

Also from there, but from an updated version to which I have access:



(LT 455 W) Characteristics

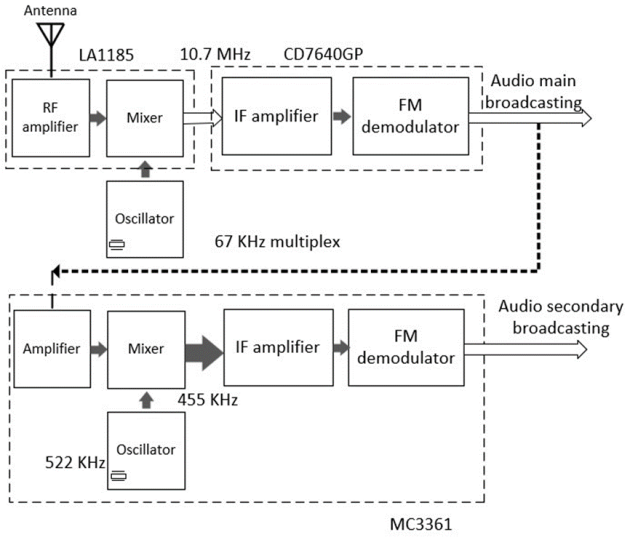


(LT 455 U) Characteristics

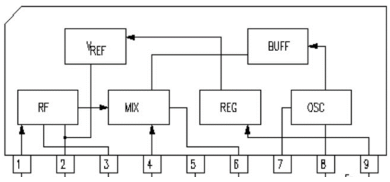
Another interesting component is a 2-pin 522 KHz ceramic filter/resonator. Since the subcarrier is 67 KHz, the manufacturer of the radio I found in the garbage used those 67 KHz to subtract from the 522 KHz to obtain 455 KHz, then amplified the signal further, then decoding it to narrow FM. This was more than necessary, because those subcarrier transmissions are done with lower power than the main broadcasts on which they piggy-back.

In order to understand better what I can do with the whole radio or at least with some components, it became necessary to do some reverse engineering. This was easy, because I already had a clear idea of how the whole radio functions based on the integrated circuits that I know very well and which I had already used in ham radio construction in the past.

The block diagram of this FM SCA radio that I drew.

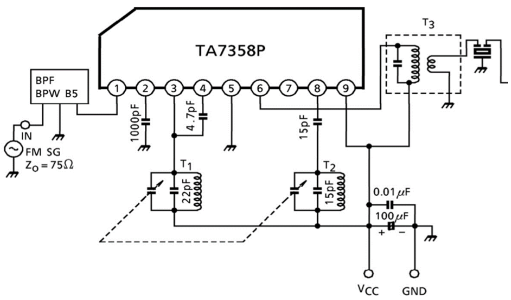


From the antenna the signal goes into an LA1185 integrated circuit. It is equivalent to TA7358. In my found radio the oscillator is made with a separate transistor, but the integrated circuit does have in it an oscillator as well.



The datasheet can be found at: http://pdf.datasheetcatalog.com/datasheet/sanyo/ds_pdf_e/LA1185.pdf or a better version, from Toshiba at: http://pdf.datasheetcatalog.com/datasheets2/24/246689_1.pdf

The recommended schematic is shown from the datasheet.

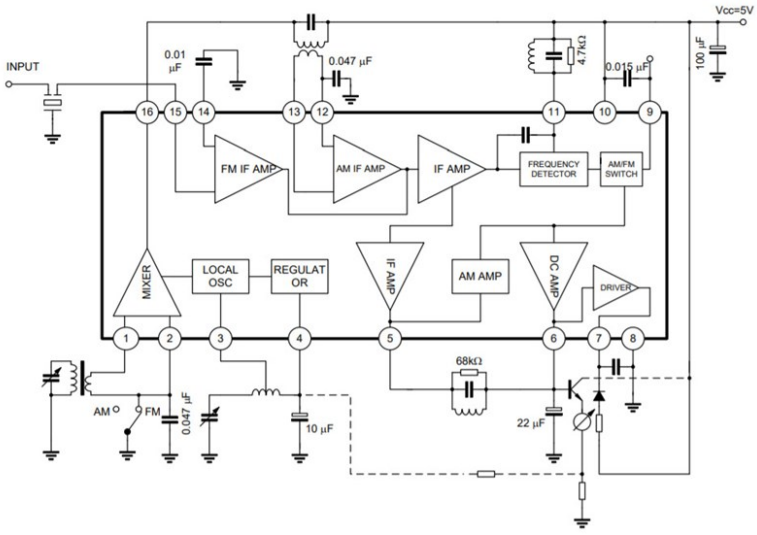


Having the 9 pins all on one side, it is easy to unsolder. One can say it is just around 60 cents apiece, so why bother. An integrated circuit in hand, now, values more than an integrated circuit ordered over the Internet if you need it here and now.

The LA1185 is an FM receiver front-end IC. It works between an 1.5 V and 8 V power supply. The input at pin one is low impedance, 57 Ohm. In many ham radio schematics this IC will be used with input directly to pin 4 (into the mixer), because there it has 2.7 Kohm impedance. It has everything in it to be a nice converter. Some ham radio uses for it:

- QRP direct conversion transceiver: https://www.qsl.net/py2ohh/trx/49er/transceptor49ertupiniquim.htm
- A CW transceiver for 7 MHz: https://www.qsl.net/py2ohh/trx/jabaquara/jabaquara.htm
- Peter Barnes, LY3LP, made a Simple 50,1 MHz converter with LA1185: https://www.pinterest.ca/pin/479844535298931776/
- SSB transceiver for 80 meters: https://320volt.com/en/la1185-ile-80m-transceiver-ssb-cw/

The next integrated circuit in my found radio is CD7640GP. It is the same as TA7640. It is a full AM radio and a wide FM intermediate frequency amplifier and demodulator.



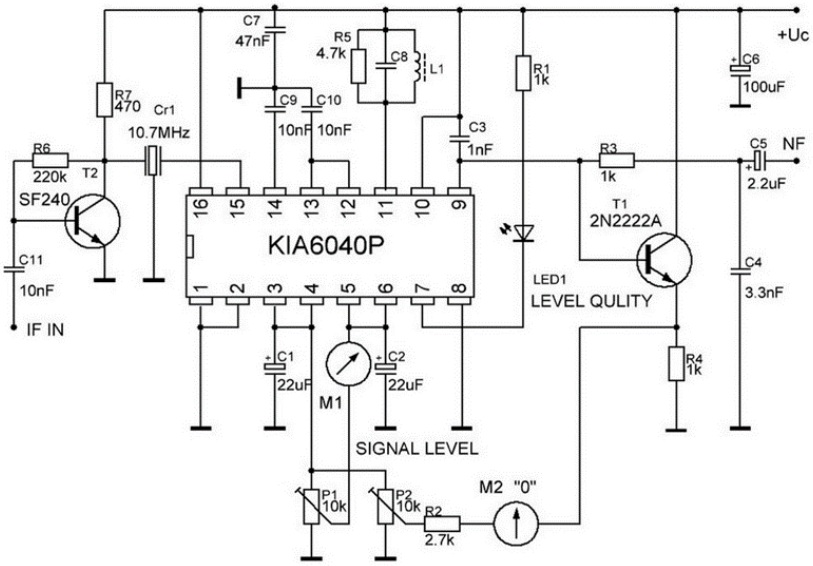
If you know Chinese, this datasheet is for you:

https://pdf1.alldatasheet.com/datasheet-pdf/view/144194/ETC1/CD7640GP.html

if not, an English version:

http://www.unisonic.com.tw/datasheet/TA7640AP.pdf

It needs between a 3.8 V and 8 V power supply. Valeri Terziev tested various integrated circuits for FM only use, and came to this schematic:

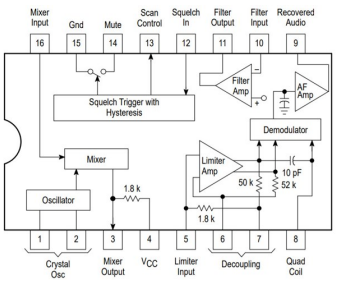


From:
https://www.kn34pc.com/construct/v_terziev_ukw_rx_2.html

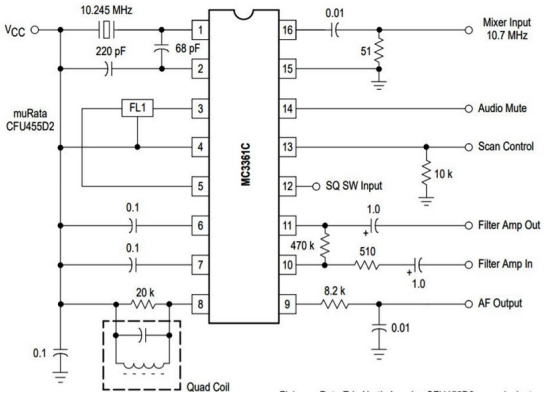
Unsoldering a 16-pin integrated circuit requires some skill. It can be a good exercise, but even finding technical specifications and information about ham radio applications can be useful.

Observation: all those FM integrated circuits are meant for a wide deviation of frequency, and narrow FM will make them lose sensitivity.

There is another gem in this radio find at the garbage: MC3361 *[left]*.



This is a dedicated low power narrow band FM intermediate frequency circuit. It usually has 10.7 MHz as input frequency signal. It contains an internal oscillator, usually driven with a 10.245 MHz crystal, to obtain the second intermediate frequency of 455 KHz, which is amplified and demodulated as narrow FM, which we need in our ham radio communications.

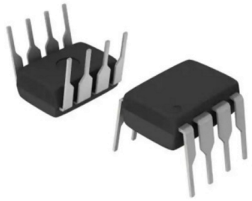


The Motorola datasheet can be found at: http://www.om3bc.com/datasheets/mc3361.pdf

I have seen it used in many, many ham radio schematics. For example:

- Simple narrow FM detector: https://www.oselsan.net/icerik.asp?pid=205
- Or as SSB product detector in a superhet receiver: http://www.vk6fh.com/vk6fh/40mx_rcvr.htm
- Main IC in a dual conversion superhet receiver for a 10 m repeater (29.690 MHz) located south of Hamburg on the radio tower in Rosengarten: http://dl4cs.de/en/?Crystal_controlled_superhets___Dual_conv._super_for_29%2C690_MHz_FM

The audio part from the radio I found at the garbage bin is based on TDA2822M *[right]*.



It is an obsolete product. It was not user friendly; it self-oscillated and it burned out very easily. I used it several times, and I always regretted it.

Final comments

Somebody made a similar schematic receiver as I found at the garbage bin, and posted on May 24 2020 on YouTube:

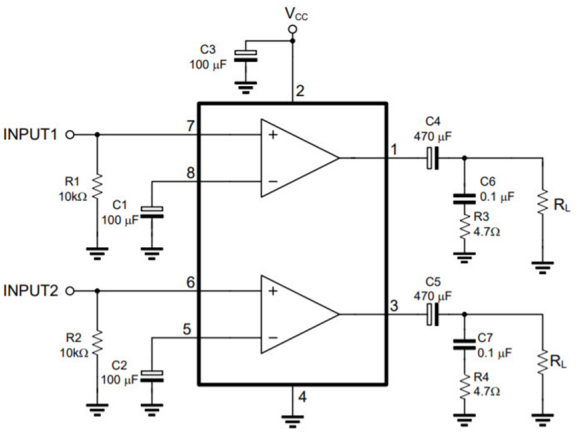
https://www.youtube.com/watch?v=gquDxR-IOYg

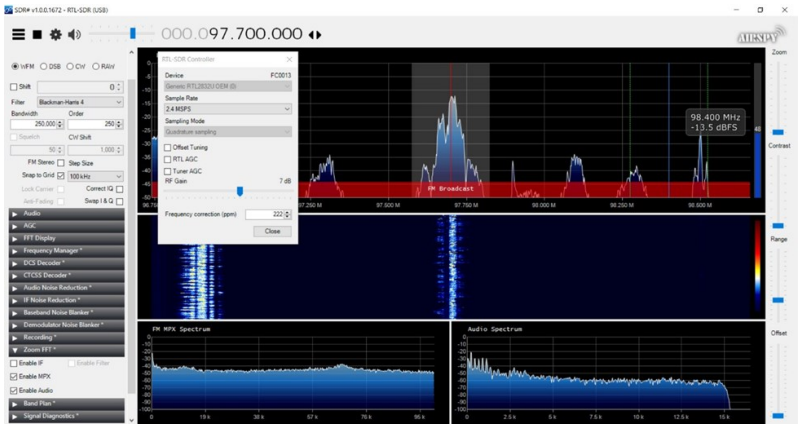
It is possible to buy FM SCA radios from Amazon and other websites. Metrosonix builds such radios:
http://www.metrosonix.com/

It is interesting to disassemble and reverse engineer – at least the principles of their function - of various radios, especially if they are found free. If they do function it is even better, because they might be adaptable for ham radio use. SCA FM radio are no longer something of interest for the general public. Understanding how they function might be a pleasant experience for ham radio people – it is a radio, so it is connected with our activity and with FM modulation.

If you want to hunt down which FM broadcasts in your area use SCA (that meaning using subcarriers for other services, most probably other audio transmissions on 67 KHz and 92 KHz), the easiest thing to do is to look on your screen on the real time MPX window of a software defined dongle. I used SDR sharp and a cheap RTL2832 based dongle. Look for bumps in the 57 KHz region (which is the radio data system RDS signal), 67 KHz and 92 KHz. One cannot decode SCA directly with one instance of SDR sharp. See next screenshot. The bump at 67 KHz is barely visible (lower left blue window), and it is barely visible only after I killed the automatic gain control in my SDR dongle; otherwise I could not see it. And still, if I start the radio found at the garbage bin, I hear Radio Fiji Mirchi loud and clear.

~ Daniel VE7LCG





VE7SL's Radio Notebook

6 Meters—Part 2: FT8 And The Magic Band

Steve McDonald VE7SL

Today's blog is directed to those that may be new to 6m or new to using FT8 on 6m. Some of the things discussed will make your experience on the magic band better for you and better for your neigbours.

Unlike using FT8 on the HF bands, 6m presents some different challenges, especially if you operate in a region where there may be a lot of other locals also using the band at the same time.

Although the weak-signal capability of FT8 has made it possible for many smaller stations or those with makeshift antennas to take advantage of the unique propagation 6m has to offer, it also can create problems for other users of the band when used inappropriately. In regions of dense population, even small stations can create very high local signal levels, often making it impossible for their neighbours to hear weak signals. This is not deliberately-caused QRM but arises when some operators operate 'against the flow' and transmit on the opposite 'sequence' to everyone else in their local area.

On HF, one can transmit or listen on whatever time sequence they wish. Chosing 'TX 1st' or 'TX 2nd' is usually determined by who you hear calling CQ or who you wish to work. On 6m however, in a densely-populated region of local operators, choosing to transmit whenever you want to is a luxury that can create big problems for your neighbour who may be trying to hear that weak DX signal while you are transmitting!

These problem will not occur if everybody in the region uses and follows the same transmit-receive periods, so that everyone is listening or everyone is transmitting at the same time ... one or the other. Unfortunately, this 'ideal' system falls apart easily when one or more of your neighbours is not using the same sequence as everyone else.

For the past few years, a protocol that seeks to alleviate this problem has become popular and well accepted by those familiar with it. Those new to 6m may not know about it or understand the reasoning behind it.

Above all, I would urge new users of the band, or to the FT8 mode, to first listen carefully for a few minutes, before beginning operation, to determine what the majority of stations in their local region are using for sequencing. If they are using 'TX 1st', then your choice of 'TX 2nd' will likely cause hearing difficulty for many others, as well as for yourself.

Although there are no strict rules, there is a very successful and well-practiced protocol, and that is that the 'easternmost' station transmits on '1st' while the 'western end' goes 2nd'. This is why you will hear most eastern

stations in the morning hours transmitting '2nd', as they are usually calling or looking for Europeans to their east, who are transmitting '1st'. By the same token, you will also hear western stations transmitting on '2nd', who are also looking for Europe to their east, transmitting on '1st'.

This sequencing protocol usually reverses later in the day when signals from Asia become a possibility, and all North Americans then become the 'easternmost' stations and will transmit on the '1st' sequence ... unlike in the morning. I can easily see how newcomers to the band could become confused, when they hear both sequences being used! The best thing, once again, is to listen carefully first and then 'go with the flow'.

You can read about the UK's Six Metre Group's initiatives regarding these protocols HERE.

OK... so you're not interested in EU or Asia? Then it shouldn't matter to you which sequence that you use and best operating practice would again be to 'go with the flow' in consideration of other users.

A few days ago I saw a prime example of exactly what not to do, in too many respects. I made a posting on the ON4KST 6m chat page that VE1SKY in NS (Nova Scotia) was being decoded here, mainly to alert others in my region that European signals might be coming next, as hearing the VE1s in BC is often an indicator that the European path is building.

In less than a minute, an S9+ local began calling 'CQ NS' on the exact opposite sequence of all others ... effectively blocking the waterfall and any possible hope of hearing weak EU signals. I'm sorry, but this is just terrible operating procedure, with almost zero chance of success, while showing no consideration for nearby users.

Just like working DX on CW or on phone, the best way, as it always has been, is to 'listen, listen and then listen some more'. You will work FAR more DX by listening and calling at the right time, than you will by calling CQ.

I also see some local stations everyday, calling endless CQs, often for over 60 minutes straight and often with many replies that go unnoticed. With FT8, one can check 'work 1st', go away, and return later to see who they might have 'worked'. Perhaps this is what these operators are doing, but they should understand that they are also creating non-stop QRM for other users ... those that choose to listen carefully to the band rather than to endlessly CQ. Once again, this is just poor practice.

You may argue that if nobody called CQ, then there would be no contacts made. There is nothing wrong with a few CQs but CQ'ing for an hour? And don't worry, there will always be other stations CQ'ing endlessly for you to hear, even if it's not a great way to operate.

With a little pre-planning for sequencing and consideration for your neighbours, everyone can and should be able to enjoy 6m FT8 with very few problems ... and that is my hope for all of us.

After forty-eight summers of CW and phone on 6m and two summers on FT8, these are some of my initial thoughts on how to best operate for maximum success and consideration for other band-users.

The latter is part of the basic framework upon which amateur radio was originally established, when back in 1914, the ARRL described in their 'Code of Conduct' for amateurs ... "The Amateur is Gentlemanly. He never knowingly uses the air for his own amusement in such a way as to lessen the pleasure of others."

Now, let the magic, and the pleasure, continue!

~ Steve VE7SL

Some 6m Summer Excitement

Steve McDonald VE7SL

With three seasons of FT8 under its belt, there's no doubt that it's taken over as the number-one mode for the 6m band ... there are very few traces of CW or SSB to be found.

What it hasn't taken away, is the magic!

For the most part, this summer's conditions from the west coast were pretty normal, except for when they weren't ... and when they weren't, they were pretty spectacular!

The spectacular parts were highlighted by one particularly unique contact that can only be attributed to some heads-up operating skills, a little help from FT8… and the unpredictability of Sporadic-E.

Above: Paul K7CW

Below: VR2ZXP is located in one of the most densely populated cities on the planet.

On June 20, at 0056Z, K7CW (Paul), south-west of Seattle, nudged his signal all the way to Hong Kong, more specifically, to VR2ZXP's crowded apartment building. But that's not the incredible part. That happened when Paul heard and exchanged signal reports with Alfred's tiny station.

VR2ZXP is located in one of the most densely populated cities on the planet. Not the best location for weak signal 50MHz DX!

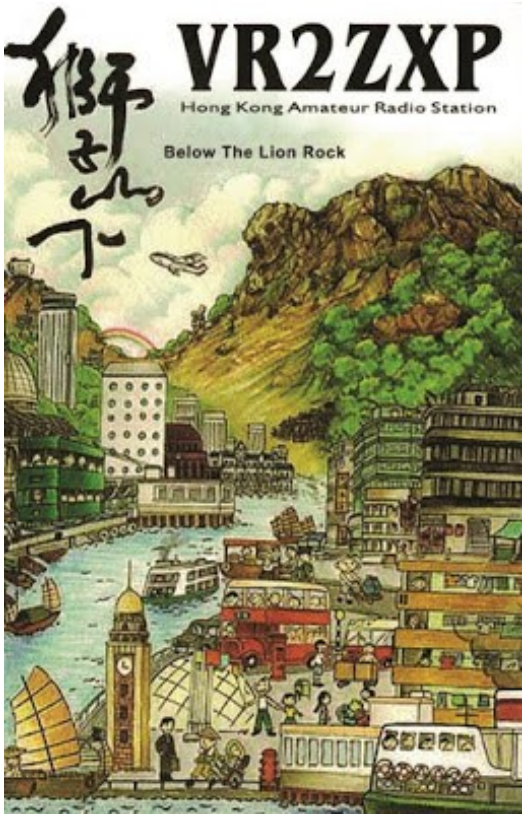
"As I told to Paul, it's a hard job to be a ham in VR2 Hong Kong especially for the DX. Hong Kong is a high density population city. 99% people are living in apartment only. The housing price here is crazy around US$1800 per sq. feet. Neighborhoods always complain why we setup antennas out of our windows and produce radiation to affect their health. So, what we just can do is to use a small whip with QRO for the QSO.

Besides, interference is also serious. Thousands of air conditioner is surrounding me and a power station 132kV to 11kV is just faced to me in 1km away. Here the noise level on low HF band at night is S9."

As indicated above, Alfred's station is located in a typical high-rise apartment, surrounded by numerous others, with no room for antennas. His solution is to clip a short (60") whip antenna, horizontally mounted on his balcony railing, similar to this one from 20 years ago ... before being surrounded by noisy high-rise apartment buildings!

I'm not sure which is the most spectacular part of this contact ... that Alfred could detect Paul's signal in such

a noisy environment using such a small makeshift antenna or that Paul was able to copy the tiny signal coming from uptown Hong Kong.



"Anyway, our QSO with Paul is really special. However, I am just a small potato on this story. Without below reason, our QSO may not be success.

1. Paul's big gun antenna and his station perfect setup.
2. The JT operation mode which introduced by K1JT Mr. Joseph Hooton Taylor. Let me have a chance to say thank you to Joseph."

However, the summertime fun did not stop here. Early on the morning of May 31st, westerners were treated to what some 6m diehards called the best European opening they've ever experienced!

Up on Vancouver Island, John, VE7DAY, was surely glad that he checked the band early, as what followed was a European opening that bounced from one country to another for over 3-1/2 hours! By the time it was over, John had bagged 66 contacts on FT8 and 19 new DXCC entities, including the difficult to work 9H1 in Malta! John's list looks more like 20m CW rather than 50MHz in mid-summer: GM, PA, G, I, DK, 4O, 9H, OM, HG, LA, HB, OE, SM, 9A, MW, YT, OK, LZ, SV!

Long openings like this occur very rarely, making them even more thrilling and can cause even the most experienced 6m DXer's mouse-hand to tremble with excitement!

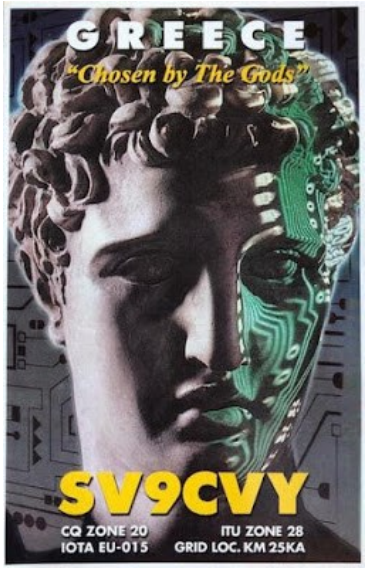
Others up and down the west coast also filled their log pages with 'new ones' ... unfortunately my exciter was on the workbench while replacing the screen so I never knew what I had missed until some time later ... probably just as well. I guess I must have been pretty naughty at some point, as the 6m gods definitely singled me out for special punishment that morning.

Once the exciter was back together I was able to catch a few good openings myself, the best of which was early on the morning of June 23 when I was able to work SV9CVY (Crete), SV1DH (Greece) and IS0AWZ (Sardinia).

Crete and Sardinia gave me DXCC #89 and #90. Three days later, during a nice opening to the southern states, J68HZ in St. Lucia snuck through the QRM for #91.

Above: K7CW's 9el - 50' Yagi at 80'

Below: Some of VE7DAY's wallpaper from the May 31st opening.



After a further three days, on June 29, another very early opening put 8 more Europeans in the log including HA8CE (Hungary) and YU7EF (Yugoslavia) for #92 and #93 respectively.

The band also produced several long openings to Asia, usually in the late afternoon hours. Several contacts were made with South Korean stations, China and dozens with Japan.

All told, the band produced some exciting activity this summer. Countries worked here were: JA, JW, TG, V31, J68, LA, SM, SV9, SV, IS0, EA, HA, YU, F, 9A5, BG, HL, EA8. Certainly FT8 had much to do with a good portion of the action but it is difficult to say just how much. Many of the Europeans were very strong and could have easily been worked on CW in a matter of a few seconds, rather than the 60 - 75 seconds required for a valid FT8 exchange, assuming there are no repeats. But it's contacts like Paul and Alfred's that continue to validate the special name given to the band ... you just never know what might tricks will be next.

~ Steve VE7SL

It seems there are summer antenna projects in the works at both VE7ZD and VA7XB

Major July Earthquake Activity

Alex Schwartz VE7DXW

A Busy Time For The RF Seismograph

Today there were 19 significant earth quakes that were recorded by the USGS ranging in the size from M4.5 to M7.8.

14 of these quakes were recorded by the RF-Seismograph. For details and a graphical capture of the propagation and explanation see graph below.

Synopsis

The 20 m band was open at the change of the day enhanced by local minor quakes. The 40m band started to come in after 00:45 UTC with another two local quakes that struck in fast succession after 01:15 UTC. At 02:00 UTC 20m band faded with the another rapid event, just after 02:00 UTC and 40 m goes into transition oscillation as the M5.1 from Columbia releases at 03:16 UTC.

Another double event of minor local quakes creates noise spikes on 80 m and 40 m at 04:15 UTC. There were more local minor quakes after 04:00 UTC and they kept the 40 m band open.

The precursor of the "Alaska event" started to create strong crackling noise on 80 m, starting at the same time and all bands started to drop out. This event was extremely strong and the first wave consisted out of a M7.8, a M6.1 and a M5.7 that released at the same location. The first one was timed at 06:12 UTC followed by the other two within 4 min and then 4 min again!

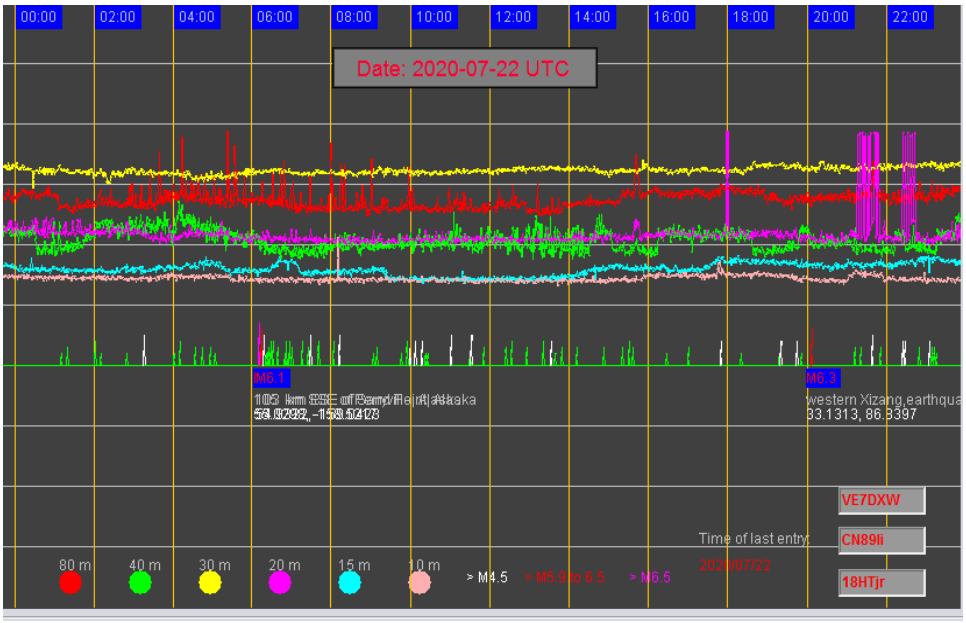
The aftershocks of the event was creating even more quakes made HF propagation extremely difficult. Interesting is the 15 m noise dome at 07:00 UTC that has a negative spike that indicates the transition from one quake to the next. There was another cluster of three quakes, two from Alaska and one from Japan all ranging from M4.5 to M4.7 and they struck at 10:00 UTC, 8 min and 10 min after. These were very weak quakes considering, but because they were so close in time, the effect was multiplied.

The "Noontime Net" also starts at that time and the 40 m propagation goes up steadily with more quakes from Alaska, a M5.1 from Alaska at 11:02 UTC and then the M5.4 off Vancouver Island. Even though the band was open, it was almost unworkable at that time, with the after noise of the Alaska event. Another M4.5 from Alaska at 13:33 UTC and some more minor local quakes created a workable 40 m propagation window from 13:00 UTC to 14:45 UTC.

Interesting is the spike on the lower bands at 15:45 UTC that was created by a meteor. After 18:00 UTC the bands did not recover, because there was another M6.3, this time from China at 20:07 UTC and the bands continued to be out

Highlights:

M5.7	123 km SE of Sand Point Alaska	2020-07-22 06:20	80 m spikes, all bands atten, precursor (-3 h to +4 h)
M6.1	103 km ESE of Sand Point Alaska	2020-07-22 06:16	80 m spikes, all bands atten, precursor (-3 h to +4 h)
M7.8	105 km SSE of Perryville Alaska	2020-07-22 06:12	80 m spikes, all bands atten, precursor (-3 h to +4 h)



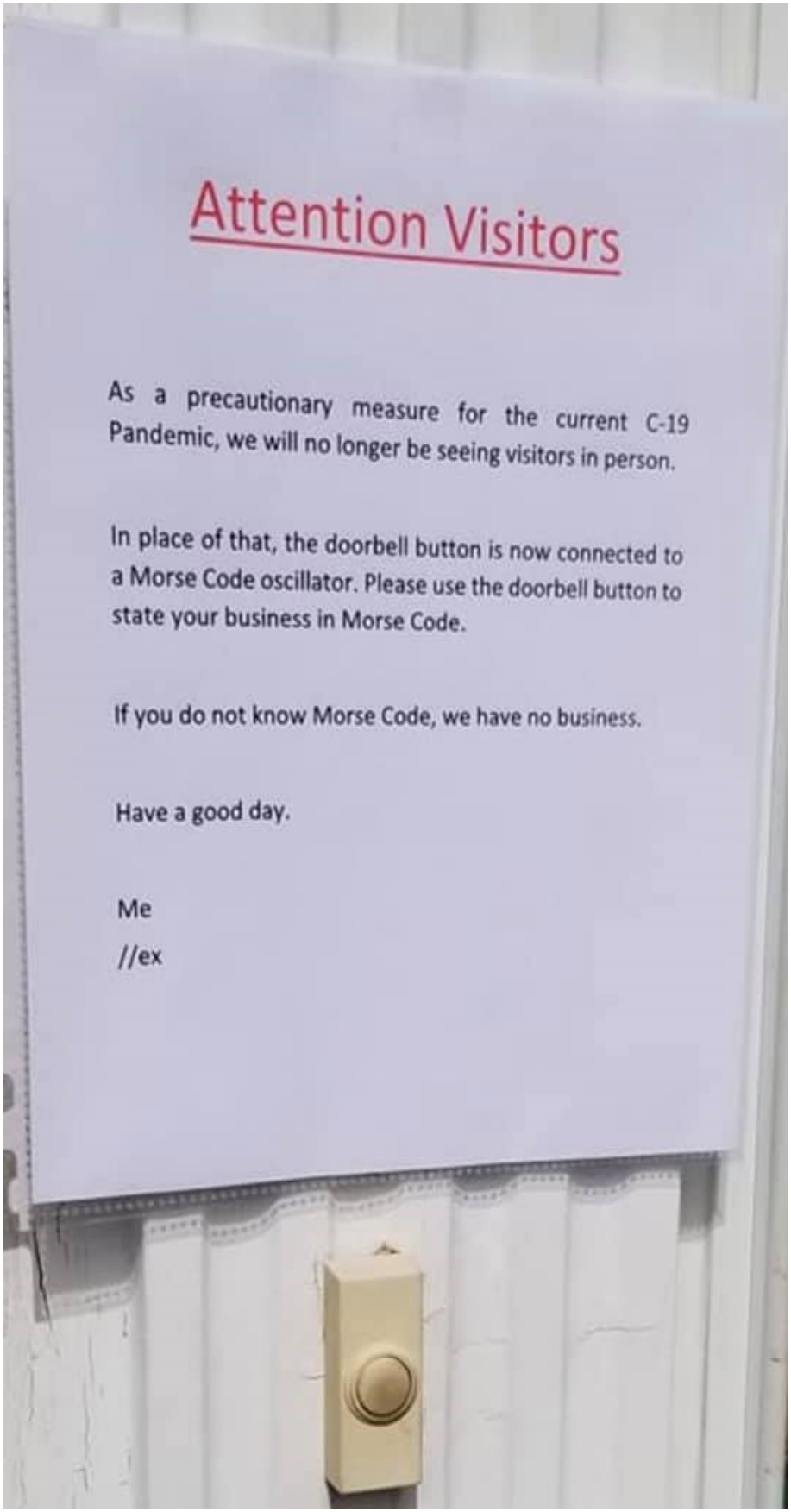
until past 21:00 UTC. Another M5.5 from Alaska then at 21:39 UTC with some help of minor quakes brought back 20 m sporadically for 45 min.

Another set of M4.6 and M4.5 quakes, one from Chile at 22:25 UTC followed by another quake from China 3 min after, continued the 20m propagation for 30 min. The last quake of the day was the M4.9 from the Aleutian at 23:06 UTC and with the help of minor quakes that followed shortly after the bands were out again.

If you want to receive these earthquakes reports on a regular basis, please join the MDSR.io group.

~ Alex VE7DXW

Mag	Location	Date & Time	Depth [km]	Detected
M4.9	Andreanof Islands Aleutian Islands	2020-07-22 23:06	46.3	20 m atten.
M4.5	western Xizang earthquake	2020-07-22 22:28	10.0	20 m sporadic propag.
M4.6	28 km ENE of Copiapa Chile	2020-07-22 22:25	96.19	20 m sporadic propag.
M5.5	Alaska Peninsula	2020-07-22 21:39	34.56	20 m sporadic propag.
M6.3	western Xizang	2020-07-22 20:07	10.0	all bands atten., precursor (-1 h to +1 h)
M4.9	133 km W of Camana¡ Peru	2020-07-22 19:45	34.5	20 m noise dome
M4.6	7 km WNW of Cepita¡ Colombia	2020-07-22 19:21	164.52	not detected
M4.6	113 km NE of Hihifo Tonga	2020-07-22 17:50	9.24	40 m transition waves, 20 m sporadic propag.
M4.5	120 km SSE of Perryville Alaska	2020-07-22 13:33	13.2	40 m propag.
M5.4	221 km W of Tofino Canada	2020-07-22 11:33	10.0	not detected
M5.1	69 km S of Sand Point Alaska	2020-07-22 11:02	35.46	40 m spike
M4.5	134 km SSE of Perryville Alaska	2020-07-22 10:18	17.6	40 m propag.
M4.7	98 km SSE of Perryville Alaska	2020-07-22 10:08	34.8	40 m propag.
M4.8	Volcano Islands Japan region	2020-07-22 10:00	10.0	80 m spikes
M5.8	72 km E of Sand Point Alaska	2020-07-22 08:13	36.71	80 m spikes
M5.1	90 km WSW of Port-Olry Vanuatu	2020-07-22 07:30	47.86	not detected
M5.7	123 km SE of Sand Point Alaska	2020-07-22 06:20	26.21	80 m spikes, all bands atten., precursor (-3 h to +4 h)
M6.1	103 km ESE of Sand Point Alaska	2020-07-22 06:16	17.67	80 m spikes, all bands atten., precursor (-3 h to +4 h)
M7.8	105 km SSE of Perryville Alaska	2020-07-22 06:12	28.0	80 m spikes, all bands atten., precursor (-3 h to +4 h)
M5.1	29 km SE of Albania Colombia	2020-07-22 03:16	97.96	40 m propag., noise incr., precursor (-1 h to +2 h)



RAC Canada 2020 Conference and Annual General Meeting

Radio Amateurs of Canada is pleased to present the "Canada 2020 Conference" to give Amateurs an opportunity to get together and see what's happening in Amateur Radio – now and in the future.

The RAC Canada 2020 Conference is an interactive mini-conference that will feature interesting presentations on a wide range of topics as shown below.

There will be parallel sessions in two blocks so that participants can choose those presentations that are of most interest to them. In addition, all sessions will be recorded for viewing later so you won't miss out if two of your favourites take place at the same time.

The Conference and the AGM will both be held on Sunday, September 20.

RAC members are invited to attend this virtual conference before the RAC Annual General Meeting which will be held the same day. Non-members will also be able to view the event online and we will provide more information as soon as preparations have been finalized.

The event is tentatively scheduled to begin at 12 noon EST. Stay tuned for further information.

There is a very long list of presentations on diverse amateur radio topics. For a full list visit: https://www.rac.ca/rac-canada-2020-conference/

Please stay tuned to the RAC Canada 2020 Conference webpage for more information.

~ Jason Tremblay, VE3JXT

Automatic Dependent Surveillance–Broadcast

John Schouten VE7TI

Yet another purpose for your cheap SDR dongle

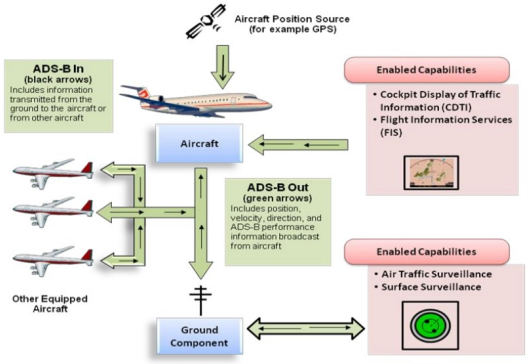
Automatic Dependent Surveillance-Broadcast (ADS-B) is a surveillance technology in which an aircraft determines its position via satellite navigation and periodically broadcasts it, enabling it to be tracked. The information can be received by air traffic control ground stations as a replacement for secondary surveillance radar, as no interrogation signal is needed from the ground. It can also be received by other aircraft to provide situational awareness and allow self-separation. ADS-B is "automatic" in that it requires no pilot or external input. It is "dependent" in that it depends on data from the aircraft's navigation system.

Using "ADS-B Out", each aircraft periodically broadcasts information about itself, such as identification, current position, altitude and velocity, through an onboard transmitter. ADS-B Out provides air traffic controllers with real-time position information that is, in most cases, more accurate than the information available with current radar-based systems. With more accurate information, ATC will be able to position and separate aircraft with improved precision and timing. Nav Canada commissioned operational use of ADS-B in 2009 and is now using it to provide coverage of its northern airspace around Hudson Bay, most of which currently has no radar coverage. The service was then extended to cover some oceanic areas off the east coast of Canada including the Labrador Sea, Davis Strait, Baffin Bay, and part of the North Atlantic Tracks around southern Greenland. The service is expected to be later extended to cover the rest of the Canadian Arctic, and to the rest of Canada.

The ADS-B system uses 1090 MHz for an operating frequency. An existing Mode S transponder (TSO C-112 or a standalone 1090 MHz transmitter) supports a message type known as the extended squitter message. It is a periodic message that provides position, velocity, time, and, in the future, intent. The basic ES does not

An example of reception of ADS-B signals from a software-defined radio dongle. These signals are not encrypted. Very inexpensive hardware and free software can be used to display on a map. the speed, course, altitude, callsign and identification of an aircraft equipped with an ADS-B transponder.

Hex	Mode	Sqwk	Flight	Alt	Spd	Hdg	Lat	Long	Sig	Msgs	Ti~
C07EF2	S		WJA542	37000	499	098	50.025	-98.199	5	53	3
C05EF6	S			17200					4	16	0
C0104F	S			39000					5	2	18
C009D4	S			8950					9	200	0
C07923	S			40000					5	100	3
C03517	S	2137	WJA1680	37000	503	102	49.653	-97.296	16	435	0
C00335	S		WSV106	37000	496	099	49.263	-96.767	4	115	14
C07FB1	S	1325	WJA662	39000	500	102	49.550	-96.562	7	1016	1



offer intent since current flight management systems do not provide such data (called trajectory change points).

Anyone can monitor

Any PC (laptop or desktop running Windows, Mac or Linux) can be used with the free ADS-B software to display received signals. If you want to see whether ADS-B is for you, only a $20 RTL-SDR dongle and some software setup is required. The process is well documented by a myriad of websites and YouTube videos so I won't expand on that for this article.

A couple of my grandkids are aircraft fans and we have picnicked at the end of the YVR runway to watch the planes come in. I thought that this would be an interesting project for them as well.

With writing up this article in mind, I tried several of the available packages and by far the easiest to set-up was FlightAware [https://flightaware.com/adsb/piaware/build]. This made sense as FlightAware markets the flight information it collects from sites worldwide. FlightAware also sells customized dongles with a built in 1090 MHz amplifier and filter (C$26 at Amazon.ca) and antennas. Theirs are stated to have better specs

I had a Pi-3 board available and loaded the software on a 16Gb micro-sd card. I was on the air in about 40 minutes start to finish. My generic SDR USB dongle is one that I've used for various projects for about 7 years. The last time was the excellent GNUradio workshop presented for SARC by Kevin McQuiggin VE7ZD about 2 years ago.

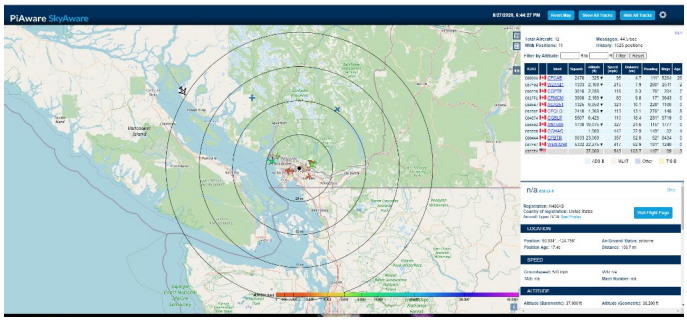
I blew off the dust and plugged it into the Pi USB port. With the antenna that had come with the dongle attached and placed on the window sill I watched as the Pi booted up. Monitoring the PiAware Skyaware URL on a browser tied to my home network I started to see flight data appear on the Lower Mainland map. Instant success!

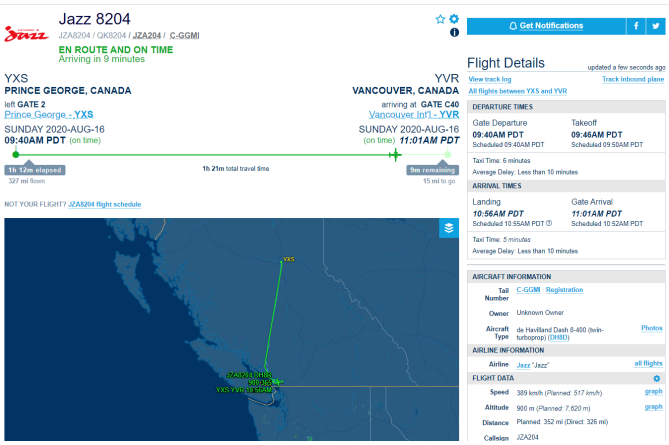
Data was coming in from aircraft only as far east as Abbotsford which I thought strange given their altitude and what should be a large radio footprint. Remembering that these dongles were originally marketed for European TV I started digging though some websites. I found that the cheap vertical antenna packed with these dongles when you buy them, is tuned for around 300 MHz. Hmmm, that is quite a way from 1090 MHz. With a mismatch like that its no wonder the range was limited.

Top: Data as received by the dongle and displayed via its local network connection to your device. Clicking on a table entry brings up reams of aircraft and carrier data.

Middle: The data shown on websites like FlightAware. Clicking on an aircraft brings up the specific ADS-B data.

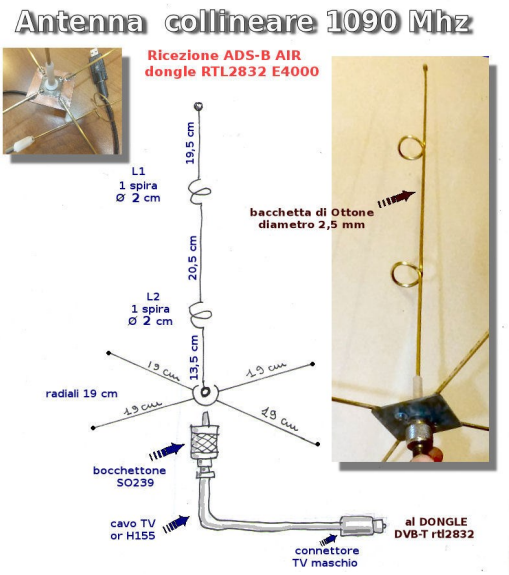
Bottom: A portion of the additional data provided to FlightAware data contributors.





Above: My 30-minute antenna creation with a significant performance gain. The centre element and radials are 69mm, a quarter wave of 1090 MHz.

Below: The Internet is full of antenna ideas and plans.



There is no lack of websites with antenna ideas for these receivers. Verticals, collinears, dipoles, j-poles, corkscrews and plate antennas were abundant. The elements on a 1/4 wave of 1090 MHz are only 69mm. That means that it is an unobtrusive antenna that needs very little material. I settled on a 1/4 wave vertical with ground radials and had all the parts I needed in my surplus parts.

Construction consisted of stripping 70mm of shield from my coax, stripping the inner conductor and soldering four 69mm radials, bent at 45 degrees to improve the match, onto a 3/4 inch square piece of circuit board that had a hole for the inner conductor drilled in the middle. More radial would probably improve the antenna but I though this an inexpensive, quick experiment.

I hooked it up outside taped to a stick at a dizzying height of 10 feet and, although it had little height because my coax was rather short, it was bound to be an improvement over the mis-matched vertical inside on my basement shack window sill.

With my homemade antenna hooked up I checked the web page and sure enough, many more aircraft now showed, farther south and east because, that was the side of my house where the antenna was located. My aluminum siding was doing a good job attenuating signals from the west although northwest Washington State and Vancouver Island showed several flights each.

I left my station hooked up overnight. Most stations are on 24/7/365, forwarding info to data aggregator sites such as FlightAware, FlightRadar24, Planefinder or ADS-B Exchange. In return for your efforts, for instance with FlightAware, you get an enterprise account worth $90 dollars (per month), so if airplanes are a big part of your life, your own ADS-B station is well worth the investment. Other sites also offer premium accounts, and you will get the benefits even when you're not home or via a smartphone app, because you'll have more info of a flight including past performance, delays and historical flight times.

Like a kid with a new car trying to get some extra RPM, the following day I had to try to improve on the antenna situation. I next built the collinear antenna described by Ivo I6IBE *[diagram bottom left]*. Ivo's website and YouTube videos are in Italian however it was simple enough to figure out his design. Pliers in hand I formed the vertical elements and two coils as per the drawing, taking special care and measuring twice. At this frequency a millimeter can make a difference in tuning, but being a receive only antenna, at least transmit SWR is not an issue and you won't damage anything if you get it wrong. Unfortunately, a trial of that antenna showed minimal extended coverage compared to the 1/4 wave vertical.

Keep in mind that reception is not only dependent on the antenna and its placement. The altitude of the aircraft and any physical obstructions are also a large factor. I found that aircraft passing at very high altitudes came through at much greater distances. Once aircraft disappeared over the north shore mountains they also disappeared from my screen unless they were very high. There are Internet claims that received signals from 150+ miles away or more are not uncommon from high flying aircraft.

It was a fun experiment and illustrated again how versatile this cheap dongle is. Maybe its not Ham radio, but its RF, radio, antennas and experimentation and that's what this hobby is all about.

~ John VE7TI

Tech Topics

Simon Bisson
ZDNet

Raspberry Pi 4: How I Built a Software-defined Radio System to Track Passing Planes

Build your own ADS-B flight data receiver and mapper

This is the article that first got me thinking about experimenting with this application. A recent Twitter post by Peter Vogel VE7AFV got me off my duff and gave me the incentive.

One of the things about being in lockdown here in London is that I've had time to work on various projects that have been sat on the back burner. So in the last three months or so, I've set up a much improved microphone and camera system for podcasting and streaming, built a new time-lapse rig for the sky that passes by, practiced my wildlife photography on the local suburban critters, and built and set up a software-defined radio system to track passing aircraft.

That last one is perhaps the more interesting for ZDNet's readers, as it's how you can start to feed aircraft location data into a growing network of tracking stations that uses the GPS locations most aircraft transmit to build a global map of air traffic. This approach, ADS-B, is intended to make it easier for aircraft to locate each other and for air traffic control to keep track of them. The fact that the data is there for anyone to capture and use is just a side-effect.

Picking up the ADS-B signals is easy enough: they're broadcast on a known frequency, 1090MHz, and have to deliver data in a set format. If you've got the right receiver, that binary data can be quickly translated into coordinates that can be plotted on a map, using callsigns to look up aircraft type and owner. You've probably seen services like Flightradar24 and Flightaware in the news, offering ADS-B information to anyone with a web browser.

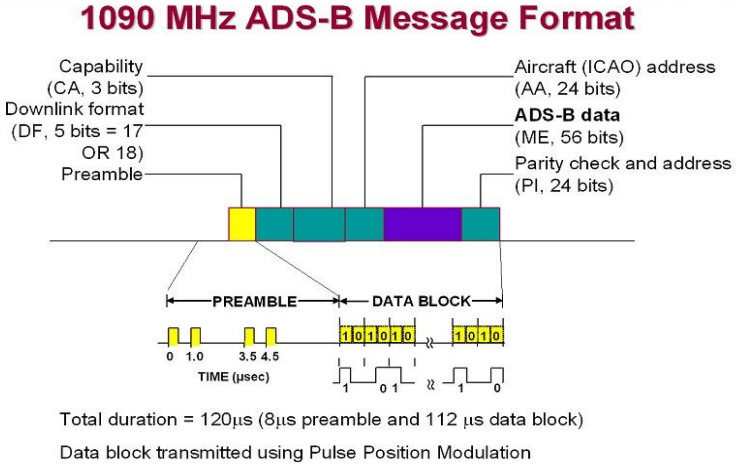
Those services get their data from a network of volunteers, with their own ADS-B receivers. Usually based around open source software, their base stations are easy enough to build and deploy, using software-defined radios to receive ADS-B signals. Most are based around a popular chipset that was originally developed to add USB digital TV receivers to PCs, with a set of APIs that made it easy to adapt for other uses.

Setting up an ADS-B base station is now as easy as getting a Raspberry Pi, plugging in a receiver, and downloading and configuring a ready-to-run system image. My system is based around a 2GB Raspberry Pi 4 in a heatsink case, with a Flightaware ADS-B radio stick, a 1090MHz desktop antenna, and a copy of Flightaware's Piaware software distribution.

For details, see the full article at https://www.zdnet.com/article/raspberry-pi-4-how-i-built-a-software-defined-radio-system-to-track-passing-planes/#ftag=RSSbaffb68

~

Below: The format of an ADS-B message



Total duration = 120µs (8µs preamble and 112 µs data block)

Data block transmitted using Pulse Position Modulation

Requirements for setting up RTL-SDR for ADS-B

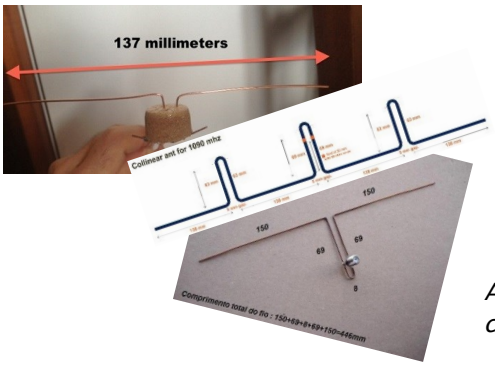
To set up an ADSB air radar you will need four things.

1. A working RTL-SDR dongle. The R820T or R820T2 tuner is recommended for best performance at 1090 MHz.
2. A vertically polarized antenna tuned to 1090 MHz.
3. Software for listening and decoding ADS-B.
4. Software to graphically display the received aircraft location data (Windows, Mac, or Linux)

ADS-B Antennas + LNA's + Filters

The stock antenna that comes with the dongle may already be able to pick up ADS-B signals, depending on how far away you are from the aircraft and what your local RF interference is like. However a properly tuned antenna is required to get decent range. There are of course commercial ADS-B antennas you can buy, but the best option for keeping in the cheap spirit of RTL-SDR is to build your own. ADS-B uses a vertically polarized signal, so only certain types of antennas will work.

Since ADS-B signals are generally quite strong, and have good line of sight opportunities, most vertically polarized antennas tuned for 1090 MHz will work well. Using a poorly tuned or poorly made antenna will just result in a lack of range for your air radar.



Antennas galore, many can be easily made

Also, ensure that your coax feed line (the length of coaxial cable between the antenna and dongle) is high quality and as short as possible.

At gigahertz frequencies long runs of cheap coax tend to reduce signal strength significantly. Use coax cable intended for satellite installations, such as RG-6, as these cables are designed for gigahertz frequencies, and they are common and cheaply available too.

A 1090 MHz filter can also help by blocking out interfering signals on other frequencies that could cause your RTL-SDR to overload. If an RTL-SDR overloads from other strong signals (e.g. broadcast FM, nearby cell/TV towers) then ADS-B reception will be degraded.

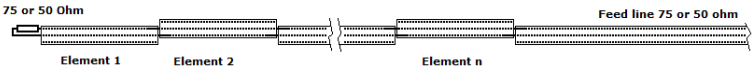
If you really want to improve your ADS-B reception and range you can also add a low noise amplifier (LNA). Due to a property of radio's called the "noise figure", it can be very beneficial to use an LNA with your RTL-SDR. The LNA can also help to overcome losses introduced by the coax cable. We recommend our ADS-B Filter+LNA (available on the FkightAware store) which was specifically designed to improve ADS-B performance by filtering out unwanted interfering signals, and by reducing the noise figure and amplifying the ADS-B signals.

Using a powered USB extension cable and placing the dongle close to the antenna may be another option to consider when thinking of ways to improve reception. Some people have placed a Raspberry Pi running RTL-SDR at the antenna, and used WiFi or an Ethernet cable to send data to a PC.

If you simply want to buy a ready to go antenna and filter then check out the FlightAware collinear antenna and 1090 MHz filter. There is a review of these products here. An alternative is the RadarBox AirNav dongle + outdoor antenna bundle available at this store for US$49.95.

Collinear Coax Antenna

A very simple and cheap antenna for ADS-B can be built out of coax cable. The collinear antenna has very high omnidirectional gain directed

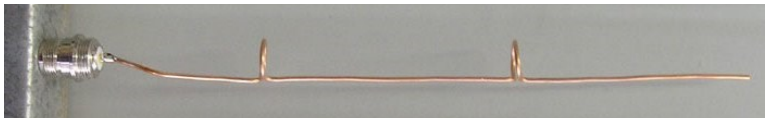


towards the horizon. This means it will receive signals best from sources that are far away on the horizon. As most planes will likely be towards the horizon and not directly above you, this is an excellent antenna for ADS-B.

A collinear coax antenna is basically a length of multiple short coax cables, where the coax outer conductor is connected to the inner conductor in an alternating fashion.

This page has an excellent write up on the design and construction of a collinear coax cable for ADS-B. Even without the antenna matching modifications, this antenna can perform very well. This video shown here shows a comparison of a Discone vs. a Collinear antenna for ADS-B. Note that a coax collinear with 4-6 elements is probably enough, too many elements and the radiation pattern becomes too flat causing even worse reception.

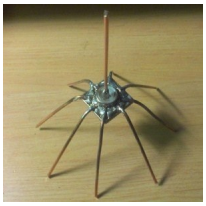
Collinear Wire Antenna



The write up shown here shows a collinear antenna made from copper wire which is intended to be used with WiFi signals. To use with ADS-B, the antenna lengths can be recalculated for 1090MHz using the equations given on that page.

Quarter Wave Ground Plane Antenna

A small compact antenna that works well with ADS-B is the quarter wave ground plane. A good tutorial on constructing a quarter wave ground plane antenna for ADS-B recetpion can be found in this pdf file courtesy of atouk. Another pdf tutorial on quarter wave ground planes can be found here. A ground plane antenna can also be made using this calculator and this design. Some people have even reported success with using a coffee can tin lid as the ground plane.



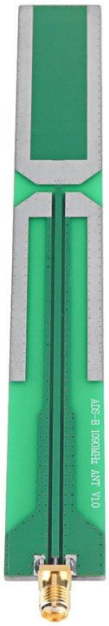
The stock antenna that comes with the dongle can be turned into a ADS-B tuned quarter wave ground plane fairly easily. Simply cut the antenna down to around 6.5 cm in length and then place it on a metallic surface such as a large can lid that has a

The RTL-SDR can be used as a super cheap real time air radar. Modern planes use something called an ADS-B (Automatic Dependent Surveillance-Broadcast) Mode-S transponder, which periodically broadcasts location and altitude information to air traffic controllers. The RTL-SDR can be used to listen to these ADS-B signals, which can then be used to create your very own home aircraft radar system. Compared to dedicated commercial ADS-B receivers which can go for between $200 - $1000, the $20 RTL-SDR is very attractive for the hobbyist in terms of price. However, note that the RTL-SDR probably shouldn't be used for ADS-B navigation aboard a real aircraft for safety reasons.

ADS-B broadcasts at a frequency of 1090 MHz. It has been discovered by the RTL-SDR community, that the RTL-SDR with R820T tuner has the best sensitivity at this frequency. The E4000 and other tuners perform poorly in comparison. So it is recommended that you obtain an R820T tuner if you want to set up ADS-B decoding with the RTL-SDR. Recently there has also been talk about the R820T2 tuner, which seems to have slightly better performance too. See the Buy RTL-SDR dongles page for more information on where to purchase.

We also now note that recently new higher end SDR's like the $199 Airspy have developed very good ADS-B receivers that are several times more sensitive that the RTL-SDR.

Here is a video demo:
https://youtu.be/xkQiB07-a04



radius of around 6.5 cm. If you have a telescopic stock antenna, fully collapse it down to its shortest length of around 9.5 cm and do not place it on a metallic surface. Basically, you can compensate for lack of a large ground plane by making the antenna longer which is why 9.5 cm with no ground plane works well for 1090 MHz. Note that unless it's an improved version, the coax cable on the stock antenna is bad and you will loose several dB's of signal due to it.

PCB Antenna

There is also this interesting PCB antenna *[left]* made for ADS-B reception. See one on eBay.

ADS-B Preselectors

Many people have reported getting much improved reception after applying a 1090 MHz band pass filter to their setup. For example, see this post here where the experimenter was able to massively increase the number of ADS-B messages received with the band pass filter attached.

One good band pass filter design is this PCB based hairpin filter. Another good option is a 1090 MHz SAW filter component which can be cheaply purchased from Ebay for around $10. These components are small and require decent soldering skills. See this image for an example of one wired up. A ready to go plug-in ADS-B filter can also be purchased, but these cost much more.

ADS-B Listening and Decoding Software

Currently, there are multiple software options available for listening and decoding ADS-B signals with the RTL-SDR. All software is free.

RTL1090

RTL1090 is a windows based ADS-B decoder with graphical user interface. RTL1090 can be downloaded from here. Use the RTL1090 IMU installer as this will help download all the files needed to make this software run.

Recently the RTL1090 series 2 beta has been released. It promises to eventually have improved ADS-B decoding, so keep an eye out. The latest beta version now also includes a simple built in scope for visualizing aircraft positions.

gr-air-modes

A plugin used in GNU Radio for decoding ADS-B. The gr-air-modes Git site can be found here. Note that gr-air-modes may not have been updated to use the newer GNU Radio 3.7 version yet.

Graphical ADS-B RADAR Display Software

The decoders mentioned above all send the decoded ADS-B data through a local (or public if desired) network connection. There are a few software options available for receiving this network data and displaying it. Here we list four of the most popular, three are free, and one is paid with a trial option.

Virtual Radar Server

Virtual radar server is free software which displays plane positions in a browser window using Google maps. The map can then be shared with other people over the internet if desired. The ADSB# tutorial in this pdfm file written by Henry Forte explains how to set up Virtual Radar Server with ADSB# easily. Virtual radar server can be downloaded from here.

You can also search in Google using the string in url:"VirtualRadar/GoogleMap.htm" to find public Virtual Radar Servers.

Video Tutorial

Corrosive's tutorial on his SignalsEverywhere shows us how to set up an ADS-B receiver with dump1090 and Virtual Radar Server. It is on YouTube at: https://youtu.be/6pJyCHh_cpE

Some Tips

- ADS-B signals are line of sight. So that means the antenna should not be obstructed by things like trees or buildings. Put the antenna up as high as possible.
- Check what tuner gain settings give the best reception at 1090 MHz in SDRSharp first.
- Use high quality coax cable for your feed line between antenna and tv dongle. At high frequencies such as 1090 MHz, cheap coax can lose signal easily. RG-6 or better coax is recommended.
- If possible, place the dongle close to the antenna, and use a powered USB cable to reach the computer.
- An LNA such as this or this may improve performance.

- If you have out of band interference at 1090 MHz, check out this ADS-B filter design.

- The R820T is the best RTL-SDR tuner to use at 1090 MHz and the R820T2 may work even better *[right]*.

Click for a purchase link

This article is a condensation of an entry at https://www.rtl-sdr.com/adsb-aircraft-radar-with-rtl-sdr/ For the full article and options, please visit this site.

~ rtl-sdr.com

Radio Society of Australia Digital Magazine

The Radio Amateur Society of Australia, QTC, is now a fully electronic edition.

This new format is best viewed on tablets or larger monitors. By using your browser, you get the magazine look and feel, embedded videos and dynamic hotlinks which allow you to click through to external web sites

If you prefer, you can still create a PDF version. When you view the digital magazine, simply print a copy to a PDF file on your computer. To access all our QTC magazines just follow this link: www.qtcmag.com

High School Marine Buoy Transmitter

Now Active On 20m WSPR

High school marine buoy transmitter now active on 20m WSPR

Phil Karn KA9Q, Randy Standke KQ6RS and students at the Mount Carmel High School Amateur Radio Club have constructed and deployed an amateur radio marine buoy, callsign KQ6RS, transmitting 14.0956 MHz USB WSPR

In a post on the AMSAT Bulletin Board Phil Karn KA9Q says:

Over the past year, Randy, KQ6RS and I have mentored the MCHSARC in designing and constructing a simple marine buoy that was deployed from the R/V Sally Ride this morning about 700 km off the coast of southern California. It is up and transmitting WSPR on 20m using the callsign KQ6RS, and is being received all over the US and into Canada and Brazil.

The electronics is the 20m WSPR version of the WB8ELK "pico tracker" that has been flown quite a few times (including by us) on long duration balloons. We removed the solar panels and substituted 21 ordinary alkaline D-cells wired to supply 4.5V. We estimate battery lifetime will be 6 months.

The basic design was inspired by Bob, WB4APR, at the US Naval Academy. Physically, the buoy is just a 5' section of 4" PVC pipe, ballasted at one end to float vertically in the water. The top is closed by a sewer pressure test plug I found at Home Depot; it has a bolt in the center that acts as a convenient feed-through and mounting point for the antenna, a stainless steel CB whip with a matching network designed, tested and carefully tuned by Randy. We use the sea as a counterpoise, but to avoid direct metal/seawater contact we lined the inside of the pipe with copper tape to form a capacitive connection. We probably spent too much time on this; Randy even modeled the electrical fields in the seawater with a professional RF analysis package.

In our first flotation tests in Randy's swimming pool we found that the ballasted pipe, by itself, was remarkably stable in pitch, roll, sway and surge but oscillated a lot in heave (up and down). To damp this Randy added cross arms at the water line to add drag in the vertical direction.

(It wasn't our intent to mimic a religious icon but that's where the physics went.) Tuning the antenna required sea water, so Randy did it from a dock on Mission Bay here in San Diego.

We tried to make this thing as rugged as we could. (My favorite saying to the students was that the sea *always* wins in the end, but we can delay that long enough to be useful.) Everything inside is held in place with epoxy or polyurethane foam. Randy reinforced the sewer plug with a PVC end cap with a hole cut in the center. Although the antenna is stainless steel, Randy covered it with a type of heat shrink with a waterproofing compound inside. Activation was by removing an external magnet placed over a parallel pair of normally closed magnetic reed switches. (Using two instead of one was my idea.) We even argued how to guard against the crew forgetting to remove the magnet before deployment. Randy found some adhesive that would dissolve and let the magnet fall away; I suggested a big REMOVE BEFORE FLIGHT tag and a float that would pull it away if it was tossed into the water.

That left the problem of deployment. We couldn't just drop it close to the coast because it would quickly wash back up on the beach. We needed a boat ride. We were originally going on a NOAA vessel in April, but that trip was cancelled due to the pandemic. Randy secured a trip on the R/V

Sally Ride, a research ship operated by Scripps Institute of Oceanography and home ported here in San Diego.

This link shows a map of the "lawn mowing" pattern they follow to measure and sample sea water off southern California. We were deployed early on the morning of July 16 at the most southwestern point shown here:

https://calcofi.org/cruises/2020-cruises/calcofi-2007sr.html

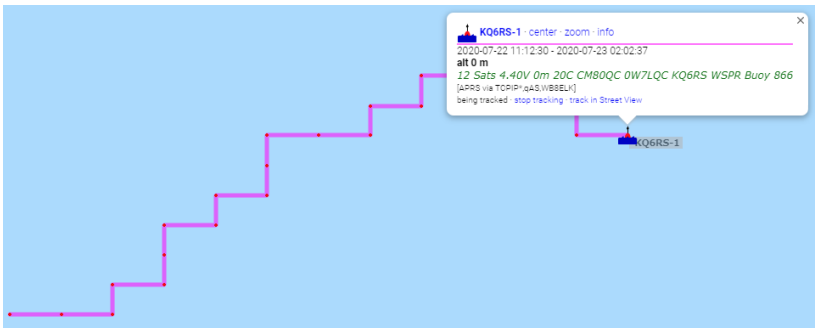
First report was at 12:52:30 UTC, July 16, from 29 51.25N, 123 37.50W. That's grid square CL89eu, which I figure is pretty rare for grid hunters.

The current carried us east into CL89fu at 20:32:30. This is a little surprising since we thought the currents in that area are to the southwest. But that's why you do science!

You can track us on aprs.fi here:

https://aprs.fi/#!call=a%2FKQ6RS-1&others=1&timerange=604800&tail=3600

We also show up on wsprnet.org



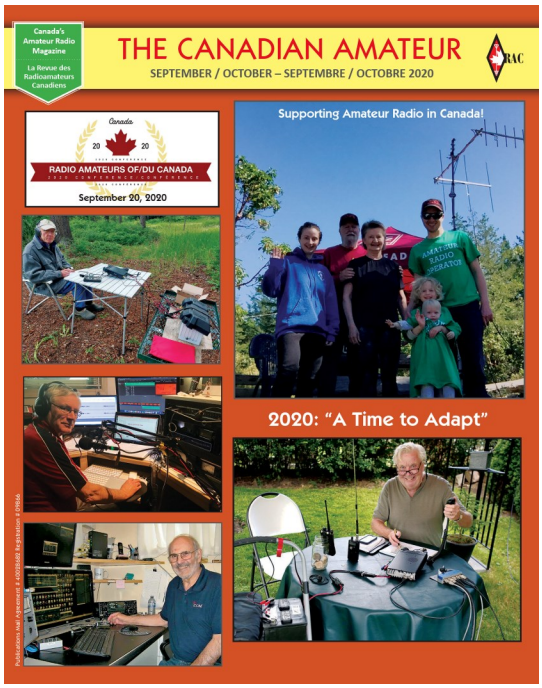
http://wsprnet.org/drupal/wsprnet/map

Because of the funky way Bill encodes position in WSPR (which was never designed for this), you'll see some weird-looking callsigns (like 0W7NFU) in addition to KQ6RS.

This was our first buoy, just to get our feet wet (ha ha). Now to think about what we want to put in our *second* buoy. Two-way links, satellite tracking, sensors, the works. But remember the "second system" effect…

~ *Southgate*

On The Local Contest Scene…



[left] The team that made a clean sweep in the 2020 BC QSO Party operating from Fred VE7IO's station; and [right] More familiar faces grace the cover and pages of the current RAC TCA magazine with an article on the Canada Day contest distributed multi-operator operation.

HAM NEWS

Amateur Rocket ATV Transmitter

Ken Goldstein, KD5HEH

Article courtesy of the Boulder Amateur Television Club 'TV Repeater's REPEATER' Newsletter

August, 2020

BATVC web site:
www.kh6htv.com

ATN web site:

www.amateurtelevisionnetwork.org

Jim Andrews, KH6HTV, editor -
kh6htv@arrl.net

The goal of this project was to create an ATV transmitter carried aboard a high altitude amateur rocket that would broadcast flight video and audio to a receiver and recording device on the ground. I've put video cameras on rockets before that record flight video which could be viewed after being retrieved from the onboard camera. The problem with that method of video recording is that if the rocket is lost, malfunctions, or the parachute does not deploy properly, there is a good chance that the video is lost too. With an ATV transmitter, you would at least be able to view the flight in real-time and record the view from the rocket up until any mishap.

The heart of the ATV package is an MFJ-8709 Analog ATV transmitter. I found that the maximum power I could get out of mine was close to 4 watts. These run super hot, and the instructions warn not to let the temperature get over 149 F. I attached a heat sink from an old Pentium processor to it, but that was not sufficient. Below the heat sink, I added a 12 volt 2.5 amp four inch diameter Attwood 1749-4 Turbo 4000 Series II In-Line marine bilge fan which pulls 200CFM of air over the transmitter and heat sink. There are 2 x 1.25" air intake holes near the top of the tube housing the ATV package and 2 x 1.25 exhaust holes near the bottom. The fan caused noise to display on the video transmission. That was resolved through the combination of using a Delta FL75L07 filter module on the fan motor, wrapping the fan motor and filter in RF blocking Faraday tape, and placing an aluminum plate below the antenna. Since I didn't want the fan to run continuously, a HiLetgo W1701 12V DC temperature switch was set to turn on the fan when the case temperature of the MFJ-8709 reaches 122 F.

Powering everything is a Maxpacks.com 13.2V 5000mah NiMH battery. It fits inside the PVC pipe below the Eggbeater antenna *[photos next page]*.

The antenna is a homemade 70cm Eggbeater design made from #8 gauge copper wire based off of Anton, ZR6AIC notes at:

http://zr6aic.blogspot.com/2013/03/building-my-eggbeater-ii-omni-leo.html

For remote control of the ATV transmitter I used a WJ9J DTMF repeater controller connected to an old small Standard brand 2 meter 5 watt HT. Two DTMF controlled automotive relays are wired to the controller.

One controls power to the ATV transmitter and the other can power a

sonic beacon and also fire a backup parachute ejection charge if the altimeter based parachute ejection fails.

The controller transmits high or low tones on the 2 meter simplex controller frequency to indicate the status of the connected relays.

The WJ9J controller automatically transmits my call sign every 10 minus over the ATV audio as well as on 2 meters. It can also be remotely commanded to broadcast a long tone on 2 meters to be used for radio direction finding if the packets from an onboard APRS tracker cannot be received by the search and recovery crew. When the recovery crew is in the vicinity of the downed rocket, the sonic beacon can be remotely turned on to make locating the rocket easier as they would just need to home in on the loud siren sound.

~ Ken Goldstein KD5HEH
Rio Rancho, New Mexico
kd5heh@gmail.com

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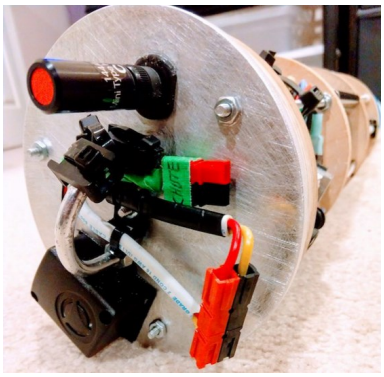


Ham Tidbits...

Antennas for Small Gardens Webinar

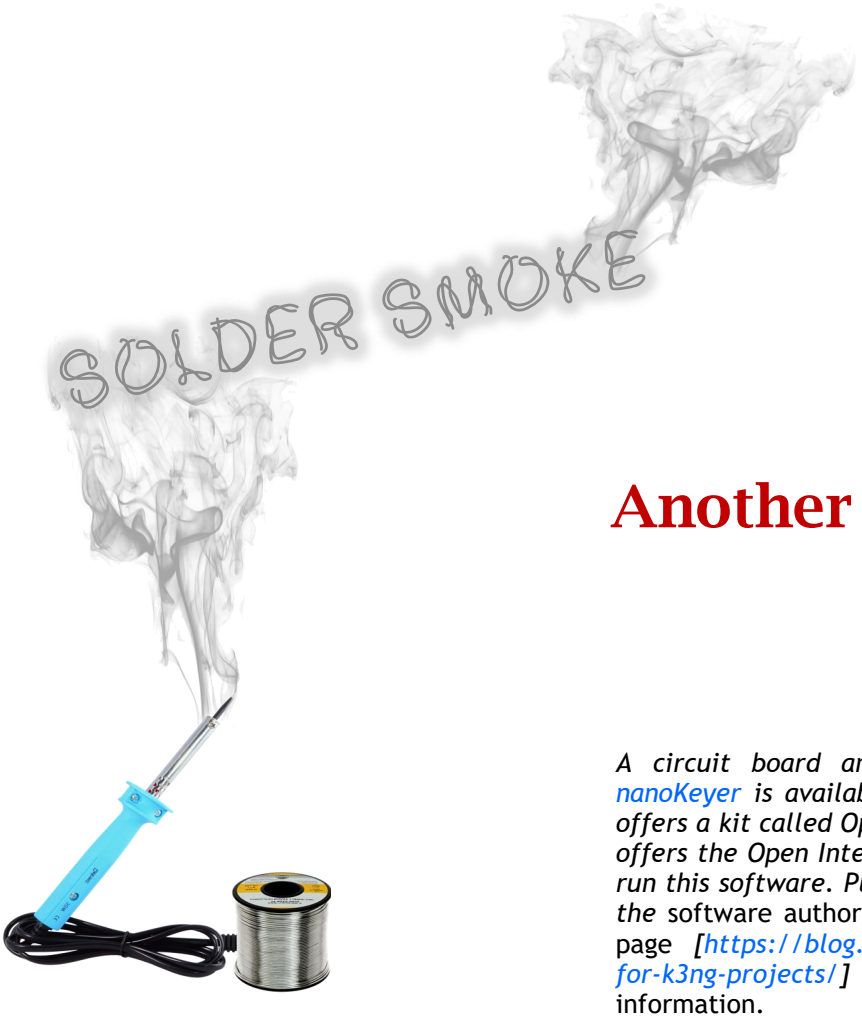
RSGB's webinar 'Antennas for Small Gardens' features Steve Nichols GOKYA

Not everyone has room for a mast and HF Yagi. In this webinar Steve looks at alternatives for small gardens, including both commercial and home-made variants. He'll also talk about testing antennas using WSPR and modelling them using MMANA-GAL. https://www.youtube.com/watch?v=TuzAvuXL6JE

A popular mobile game has been taken offline in mainland China for "rectification work", after netizens discovered its musical director had written a song containing Morse code with a hidden Hong Kong pro-democracy message.
https://www.bbc.com/news/blogs-news-from-elsewhere-53488011

Early Mobile Operation

You used to be able to tell a die-hard ham radio operator on the road by the number and length of antennas protruding porcupine-like from their vehicle. There are still some mobile high frequency operators that have respectable car-mounted antenna farms, but they have nothing on Alfred H. Grebe. In 1919, he fitted a medium wave transmitter in his car that operated around 2 MHz. Since it needed a very large antenna, Grebe rigged a wire antenna that looked like a clothesline between the two bumpers. Obviously, you had to stop, set up your antenna, and then operate – you couldn't talk and drive. But this may have been the world's first automotive radio setup for voice communication. Read more about early mobile operation at: https://hackaday.com/2020/07/16/ham-radio-mobile-operations-circa-1919/



Anthony Good K3NG

Another Arduino CW Keyer

A few issues of The Communicator ago we featured several Morse code keyer plans. It seemed to strike a receptive audience as there were several comments and a request for more. Based on the recommendation from one of our readers in South Africa, here is yet another multi-feature keyer based on an inexpensive Arduino board.

Introduction

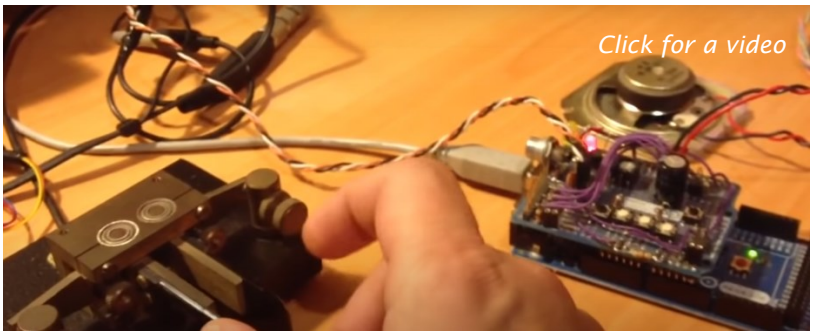
This is an open source Arduino based CW (Morse Code) keyer with a lot of features and flexibility, rivaling commercial keyers which often cost significantly more. The code can be used with a full blown Arduino board or an AVR microcontroller chip can be programmed and used directly in a circuit. This keyer is suitable as a standalone keyer or for use permanently installed inside a rig, especially homebrew QRP rigs. It's open source code so you can fully customize it to fit your needs and also perhaps learn from it or find coding ideas for other projects.

A circuit board and parts kits called the nanoKeyer is available from DJ0MY, Hamshop offers a kit called Open CW Keyer, RemoteQTH offers the Open Interface , and The Mortty all run this software. Please do not directly email the software author for support. Consult this page *[https://blog.radioartisan.com/support-for-k3ng-projects/]* for code support information.

Various tutorials, demonstrations, and development news updates can be found on the Radio Artisan YouTube channel.

Main Features

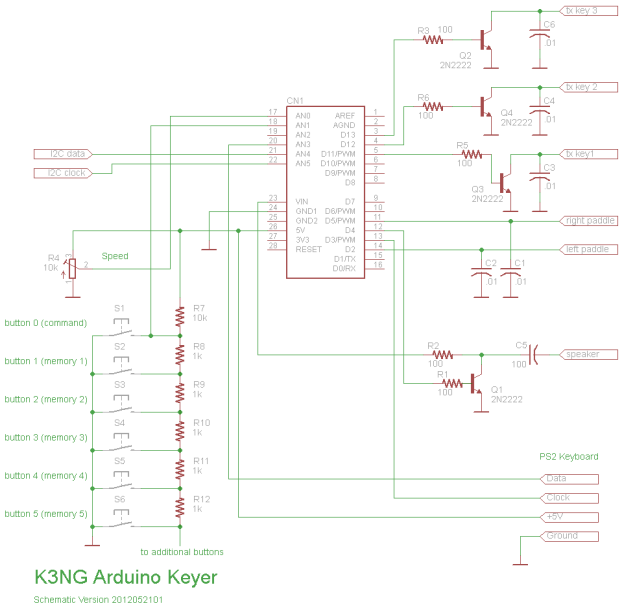
- CW speed adjustable from 1 to 999 WPM
- Up to six selectable transmitter keying lines
- Programming and interfacing via USB port



- USB or PS2 Keyboard Interface for CW keyboard operation without a computer
- Logging and Contest Program Interfacing via K1EL Winkey 1.0 and 2.0 interface protocol emulation
- Command Line Interface
- Optional PTT outputs with configurable lead, tail, and hang times
- Optional LCD Display (Classic 4 bit LCDs and I2C displays supported)
- Up to 12 memories with macros
- Serial numbers
- CW keyboard (via a terminal server program like Putty or the Arduino Serial program, or a USB / PS2 keyboard)
- Speed potentiometer (optional – speed also adjustable with commands)
- QRSS and HSCW
- Beacon / Fox mode
- Iambic A and B
- Straight key support
- Single Paddle
- Ultimatic mode
- Bug mode
- CMOS Super Keyer Iambic B Timing
- Paddle reverse
- Hellschreiber mode (keyboard sending, memory macro, beacon)
- Farnsworth Timing
- Adjustable frequency sidetone
- Sidetone disable / sidetone high/low output for keying outboard audio oscillator
- Command mode for using the paddle to change settings, program memories, etc.
- Keying Compensation
- Dah to Dit Ratio adjustment
- Weighting
- Memory stacking
- "Dead Operator Watchdog"
- Autospace
- Wordspace Adjustment
- Pre-configured and Custom Prosigns
- Non-volatile storage of most settings
- Modular code design allowing selection of features and easy code modification
- Non-English Character Support
- CW Receive Decoder
- Rotary Encoder Speed Control
- Sleep Mode
- USB Mouse Support
- QLF / "Messy" Straight Key Emulation
- USB Keyboard HID (Human Interface Device) Interface (Keyer = keyboard for your computer)
- Keypad Support
- Web Interface
- Linking of keyers over an IP network
- Mill Mode
- TX/RX Sequencer
- Training Module and Various Practice Modes
- American Morse Mode

Some videos featuring the keyer:

Basic Schematic *(Click to Enlarge)*



Note: Ignore the numbers on the outside of the Arduino symbol and refer to the numbers within the box for pin connections (i.e. D2, D3, A0, etc.) All capacitor values are in microfarads (uF), unless otherwise stated. No values are super critical and typical tolerance components may be used. 1K ohm resistors are better suited than the 100 ohm transistor base resistors shown in the schematic. Use 1k resistors; I am in the process of updating the schematic.

KF4BZT Article – Good information for new builders!
https://kf4bzt.wordpress.com/2015/08/06/arduino-cw-keyer-project/

DL1SMF Keyer Project (English Deutsch)- Stefan has details on his hardware which is pin compatible with this software and his own software. http://www.dl1smf.de/en/uno_keyer

Jeff, AC0C, wrote of his efforts to find a CW keyer with an "Old School Feel"
http://www.ac0c.com/main/page_homebrew_a_few_good_cw_keyers.html.

Barry, ZS2EZ, published a web page on his K3NG CW Keyer build, including a schematic and PC board artwork
http://www.zs2ez.co.za/k3ng-keyer.html.

Documentation

Authoritative documentation is located in the Github Wiki
https://github.com/k3ng/k3ng_cw_keyer/wiki.

Numerous helpful videos can be found on YouTube
https://www.youtube.com/results?search_query=k3ng.

The Code

Source code is located on GitHub. Click the Download Zip button on the lower right to get all the code in a ZIP file.)
https://github.com/k3ng/k3ng_cw_keyer

Older code versions can be found here. Click the commit you're interested in, click Browse Files and you will find a Download ZIP button that you can use to download that particular git commit / version.

You can find the website for this project at:

https://blog.radioartisan.com/arduino-cw-keyer/

~ Goody K3NG

https://www.youtube.com/results?search_query=k3ng.

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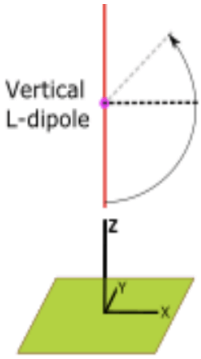
KB6NU's Column

Dan Romanchik, KB6NU

What is the Feedpoint Impedance of a Bent Dipole?



The other day, a friend of mine emailed me:

"I am putting up a multiband, right-angle dipole. That is to say that one element is vertical, the other horizontal. The vertical element is a 17-ft. telescoping whip, and the horizontal element is about 10% longer than the vertical element.

I have inductors wound for 40 meters and will try them later today. Once the antenna is working on both 20 meters and 40 meters, I will tap the inductors and get the antenna to work on 30 meters. I need inductors in both legs, obviously.

When I connect my antenna analyzer to the antenna without the inductors, I find that I have an SWR of 1.5:1 on 20 meters. Because the feedpoint impedance of a dipole is 75 Ω, my 1.5 SWR indicates resonance to me.

QUESTION: Does my SWR of 1.5 really indicate that the antenna impedance is 75 ohms?"

My initial reaction was that he was right, but then I got thinking about it. When you make an inverted vee out of a dipole antenna, the impedance drops, so it really should be closer to 50 ohms than 75 ohms. He noted that he couldn't get the SWR any lower than 1.5:1, so I guess something else is going on there. Perhaps it's too close to the condo. If any of you have had experience with this kind of antenna, please weigh in.

Here are some resources that he used for concocting this antenna:

- Bent Dipoles by KK4OBI. As noted in the article, a simulation of a bent dipole yields an SWR of about 1.2:1.
- Electrically Shortened Center-Fed Half-Wave Dipole by K7MEM
- Toroid Coil Winding Calculator
- A Lightweight Portable Vertical by WB3GCK

These are all great resources. For example, I wish I had known about K7MEM's article when I was pondering how to get on 80m from my small(ish) city lot.

We discussed this project over lunch today (via Zoom, of course), and he said,

I tested with my KX2 and got matches of better that 2:1 on 20m and 40m.

At that point, it occurred to me that I had a remote antenna tuner in the garage. I replace the matching network I built with the tuner and got better than 1.5:1 on all bands 80m-10m.

~ Dan KB6NU

When he's not trying to figure out which way current flows, Dan blogs about amateur radio at KB6NU.com, teaches ham radio classes, and operates CW on the HF bands. Look for him on 30m, 40m, and 80m. You can email him at cwgeek@kb6nu.com.

Need a DMR Explanation?

Steve Wright (EI5DD) gave a presentation on the Galway Digital Radio Network via Zoom on 27-July-2020, the recording is available here (Google Drive). It was well attended on the night with about 29 people not only from the Republic of Ireland, but also from Northern Ireland and the UK. This same presentation was also given 14-July, with an equally large number of people attending from around Ireland. Credit to Steve Wright for putting together a very interesting presentation that was very well received by all who attended.

Check out their interesting newsletter too: https://www.galwayradio.com

~

2nd Generation Foxhunt Receivers Now Available

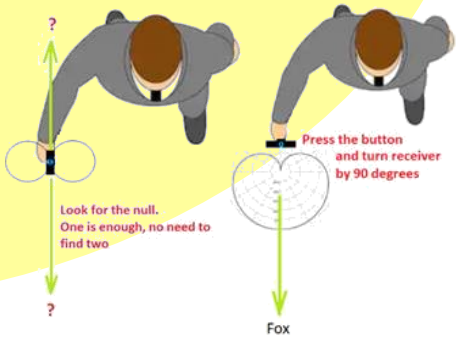
Just in time for the fall foxhunt season, second generation foxhunt receivers by Les Tocko VA7OM and Dave Miller VE7HR are now complete, with the production run tested, tuned up and available for sale.

My involvement has been in the administration and final assembly but otherwise all the credit for this technical achievement goes to Les and Dave. Having seen every unit up close, I can assure you that RX80M, as it is called, is of an exceptional professional quality. Full details on the cost, specifications, instructional video and ordering information can be found at www.RX80M.com.

Only 100 of these units are available. Although priority is being given to local orders, it will be "first come, first served" so if you want one, don't delay ordering.

80m transmitters (foxes) will be available soon.

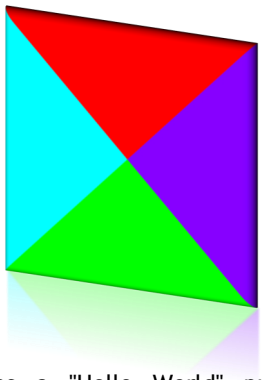
~ John VA7XB



Foundations Of Amateur Radio

Onno Benschop VK6FLAB

Homebrew Radio For The 21st Century



To listen to the podcast, visit the website: http://podcasts.vk6flab.com/. You can also use your podcast tool of choice and search for my callsign, VK6FLAB.

Full instructions on how to listen are here:

The hobby of Amateur Radio is essentially one of experimentation. Within our community we endlessly build things, from amplifiers to Yagis and every letter of the alphabet in between. With every experiment we grow the amateur radio sphere of influence just a little bit.

As our hobby is evolving into Software Defined Radio, or SDR, the homebrew aspect of our community is also changing bit by bit and as a result, homebrew today is just as likely to be based on software as it is in hardware.

Unlike the physical world where you need to source and buy components, design a circuit, build it, test it and then put it in a box, in the software realm you can get started with the computer that is more than likely within reach right now.

Recently I took delivery of a new SDR, an ADALM Pluto. It's essentially a Linux computer, FPGA and transmit capable SDR in a small box. I bought it specifically for the purpose of experimentation.

One of the first things I did with this device was install an existing piece of software called dump1090. The tool listens to 1090 MHz and decodes Mode S transponders, used by aviation to report aircraft information in real-time.

Originally written by Salvatore Sanfilippo in 2012 for the RTL-SDR dongle, it was patched by several people and in 2017 it was updated by Jiang Wei to support the Pluto SDR. My contribution to the project is minor. I've updated the on-board web-server to use Open Street Map and a few other cosmetic changes.

For me it was a "Hello World" project, something that's the software equivalent of warming up your soldering iron and pre-tinning the wire you're about to use.

The tools to do this is what I want to discuss.

When you look at the software that underlies much of the SDR world, the digital modes, logging, contesting, even the software inside tools like the Nano-VNA, much of it is open source. That means that as a curious amateur you can have access to the underlying equivalent of the circuit diagram. As you can with a soldering iron, a scribe and wire, you can patch or update a circuit. In the software realm you can do the same once you have access to the source code.

The tools you're going to get in touch with are text editors, compilers, libraries and configuration files. If that's not your thing, I appreciate that, but if it sparks your interest, you'll open the door into a brand new world of software development where you can determine how a mode works or what it supports or how it interacts with your radio or testing gear.

When you jump in, likely feet first, you're going to make mistakes and lose hair and sleep and you'll be shaking your virtual or physical fist at the person who came before you, but then that's the world of experimentation, so likely you'll already have that down pat.

You'll likely play with different tools that require different versions, often installed side-by-side, much to your chagrin when you learn that it just won't work. Not to mention

that removal of the offending tool often leaves interfering cruft behind, not unlike unsightly and short-circuiting blobs of solder.

I'm here to introduce you, albeit briefly, to a tool that will take much of that pain away. The free tool is called Docker. It has got little in the way of visibility in the amateur radio world, but in the software development world it's pretty much old hat.

Essentially the idea is that you can install stuff into a so called disposable container so you can have your copy of dump1090 installed in one container and your copy of codec2 in another, a copy of rtl-sdr in a third container, all working independently from each other, without needing to complicate things with multiple computers or virtual machines. If a developer uses Debian, another uses Ubuntu and a third uses Red Hat, you can run these side-by-side without any issue. If they need an ancient version of something, that too is handled without a problem. Make a mistake, destroy the container and start again, fresh.

Docker is a tool that allows you to build an environment on Linux, MacOS and Windows, as well as the Raspberry Pi, that acts and behaves in many ways like a virtual machine. In all the ways that you're likely to use it, at least initially, it's indistinguishable. What that means is that the operating system, the compiler and the libraries that you need for one tool won't affect those needed for another tool.

The best part of this is that you can build on a massive library of pre-existing Docker containers and use files that describe how to build and compile tools like dump1090.

If you look for my callsign vk6flab on github.com, you'll find my version of dump1090 and you'll find a Dockerfile that describes how I built it. The project contains all the bits you'll need to get started with your own version of dump1090, or some other project that tickles your fancy.

Every time you build something, the amateur radio sphere of influence grows just that little bit.

~ I'm Onno VK6FLAB

What's The Point Of This Hobby?

One of the recurring questions in this hobby, technically outside this hobby, asked by people who've not yet, or have only just been bitten by the bug, is: "What's the point of this hobby?"

In some ways I too have asked this question, though for me the answer came within a few months of learning that amateur radio exists. In response to others asking this I've also made meagre attempts to answer this question with varying degrees of success and satisfaction.

The typical responses are things like: there's a thousand hobbies inside amateur radio, it's about the communication, about the camaraderie, about climbing and hiking, about technology, science, physics, electronics. The truth is that this is just a fly-over view of what it means to have this as your hobby.

It occurs to me, having now been licensed for a little while, I can actually express a little more clearly what this hobby has given me.

At a basic level, I now know what the front of a TV aerial is and how Wi-Fi is attenuated by walls, how line of sight works and why you can talk to the International Space Station with a hand-held radio. I've learnt about sunrise and sunset and how they affect propagation, the grey line and how the ionosphere is broken into layers that are affected by solar radiation. I've learnt about sunspots and how they change over time, that there are cycles, that there is a thing called the Maunder Minimum and that propagation is a fickle beast. I've learnt about the Ionospheric Prediction Service and about band planning in contests, about dealing

All podcast transcripts are collated and edited in an annual volume which you can find by searching for my callsign on your local Amazon store, or visit my author page: http://amazon.com/author/owh. Volume 7 is out now.

Feel free to get in touch directly via email: cq@vk6flab.com, follow on twitter: @vk6flab or check the website for more: http://vk6flab.com/

If you'd like to join a weekly net for new and returning amateurs, check out the details at http://ftroop.vk6flab.com/, the net runs every week on Saturday, from 00:00 to 01:00 UTC on Echolink, IRLP, AllStar Link, IRN and 2m/70cm FM via various repeaters.

If you'd like to participate in discussion about the podcast or about amateur radio, you can visit the Facebook group: https://www.facebook.com/groups/foundations.itmaze

This podcast episode was produced by Onno (VK6FLAB). You can find more at http://vk6flab.com/

with pile-ups and making contacts, about voice-keyers and computer controlled radios, about contesting software and logging, about contest scoring and contest rules.

I've learnt about gain and about loss, about how 75 Ohm coax differs from 50 Ohm coax, how connectors work, about soldering and crimping, how to use a crimper and what connectors to use with which coax. I've learnt about path-loss and about bouncing signals off the moon, about Sagittarius A*, a bright and very compact astronomical radio source at the centre of the Milky Way and about inclination and ascension, about galactic coordinates and observation windows, about programming in Python and the astropy library.

I've learnt about how radio signals are used to encode information, the seemingly infinite supply of digital modes and how a radio signal can be described in three dimensions. I've learnt how maths can describe amplitude modulation and how side-bands can be described, about signal to noise ratios and decibels.

I've experienced the joys of making a rare contact, to places like Amsterdam Island, Prince Edward & Marion Island, Heard Island, Micronesia, Cuba, Kiribati, and many more. I've learnt more about geography, about maidenhead locators, learnt new phrases and started learning new languages.

I've gone out camping more times than I can count, spent nights under the stars making contacts across the globe. I've set-up my station in parks and on peaks across the country, made life-long friends locally and abroad, tested my patience and my endurance.

I've learnt about the pioneers and inventors who came before me, about their successes and failures, their enduring legacies and their inventiveness. I've gained insight into Apollo radio communications and distance measuring, global positioning before there was GPS, about satellite dishes and radio during disasters, about emergency communications and temporary set-ups with just enough to get the job done.

I've written software, made charts, learnt how to use GNUPlot, written articles, recorded podcasts, interviewed amateurs, published books, produced, presented and transmitted amateur news broadcasts, built amateur radio websites, chaired meetings, raised funds, contributed to club committees and helped as I was able.

I've helped organise a national amateur radio conference, learnt how to teach others and created a weekly radio net for new and returning amateurs. I've acted as a point of contact, offered life advice and acted as a shoulder to cry on when the going got tough for some of my fellow amateurs.

I've built more, tested more, explored more, learnt more and done more in the past decade than I have in the 40 years before that.

When I look back over the 472 podcast episodes I've written so-far, that massive list is only just scratching the surface and it only just begins to describe how deeply affected I've been by this hobby. It only barely describes the width and depth of this hobby and I've only been here for a little while.

I must point out that I did all these things because I could, because I had radio amateur friends who prodded and poked, who helped and asked, who gave and received. My exposure over this decade was only possible because there are others who share my interests and stopped to take a moment to express that.

Next time you're asked about how amateur radio is relevant, how it relates to the world, how it affects you and your life, what it's given you, or what you can gain from it, consider, even just for a moment, just how much is possible within this massive hobby.

~ I'm Onno VK6FLAB

No-Ham Recipes

Panzanella

Glenna Barron VE7DSC

At the peak of the summer, visit a farmers' market for a variety of sweet tomatoes in yellows, oranges, reds and purple-reds. Get medium to small ones, and a handful of cherry tomatoes. Tomatoes like this have tanginess balanced by sweetness that makes them ideal for this wonderful salad that has its roots in Tuscany. I have added Royal Black olives and have modified the dressing slightly, adding a small quantity of maple syrup; you can leave both out if you want to keep the recipe more authentic.

- 1 large garlic clove, mashed or pressed with garlic press
- 6 to 10 small to medium tomatoes
- 4 medium cucumbers, peeled and sliced
- 1 cup (250 ml) packed fresh basil leaves
- 2 tablespoons (30 ml) medium maple syrup
- 5 pieces day-old Tuscan style or black olive bread, 1 inch (2.5 cm) thick
- 1 medium red onion, finely diced
- 10 to 15 sweet cherry tomatoes
- 8 Royal Black olives, pitted and finely chopped
- 5 tablespoons (75 ml) extra-virgin olive oil
- 3 tablespoons (45 ml) golden balsamic or red wine vinegar
- Salt and freshly ground black pepper

Place garlic, tomatoes, onion, cucumber, olives and basil in a large glass salad bowl and mix together. Do not use a metal bowl.

Put olive oil, vinegar and maple syrup into small jar with lid. Shake to mix ingredients. Drizzle over the vegetable mixture; season lightly with salt and pepper. Mix salad again. Cover and place in refrigerator to marinate for 1 hour or more.

Authentic Tuscan recipes use stale bread that is not toasted. If you prefer toasted bread, grill bread in oven set on broil; toast until both sides are golden. Remove from heat, rub lightly with a cut clove of garlic if desired, then tear bread into bite-sized chunks. Place salad in serving dishes and add bread. Mix bread into salad to coat it thoroughly with the marinating liquid.

Serve immediately or bread will become quite soft.

Social Reminder

The Surrey weekly social gathering is on Saturday at the Kalmar Restaurant at 80th and King George Boulevard between 7:30 and 9:30 am. You don’t have to be a SARC member to participate. Bring your significant other, bring your family, see old friends and have fun.

Back to Basics I

John Schouten VE7TI

From The Canadian Basic Question Bank

Off-Roading and the Regs

This issue has two Back to Basics columns. Firstly, it has become apparent from our Basic courses that there has been a great deal of discussion, confusion, and misinformation surrounding the legality of the off-road community using so-called LADD and RR frequencies while travelling the back country. Many of our SARC Basic class students take the course to become certified and are under the impression that having an amateur radio operator certificate gives them legal access to LADD and RR frequencies with amateur equipment. To shed some light on this oft discussed subject, and perhaps avoid forfeiture of equipment or a fine, this Back to Basics column offers an explanation.

The focus in this column has two questions that apply. One has to do with the equipment, the other with the licencing or certification requirement:

Question B-001-006-006

Some VHF and UHF FM radios purchased for use in the amateur service can also be programmed to communicate on frequencies used for land mobile service. Under what conditions is this permissible?

A. The equipment has an RF output of 2 watts or less

B. The equipment is used in remote areas north of 60 degrees latitude

C. The radio is certified under the proper Radio Standards Specification for use in Canada and is licenced by Industry Canada on the specified frequencies

D. The radio operator has Restricted Operator's Certificate

And the second question:

B**-001-006-005**

Which of the following statements is NOT correct? A person may operate radio apparatus, authorized in the amateur service:

A. only where the person complies with the Standards for the Operation of Radio Stations in the Amateur Radio Service

B. only where the apparatus is maintained within the performance standards set by Industry Canada regulations and policies

C. except for the amplification of the output power of licence-exempt radio apparatus outside authorized amateur radio service allocations

D. on aeronautical, marine or land mobile frequencies

I will be quoting frequently from Innovation, Science and Economic Development Canada regulations and policies and will refer to them hereafter as 'ISED'.

Some definitions…

Amateur Radio Service

Amateur radio service means a radiocommunication service in which radio apparatus are used for the purpose of self-training, intercommunication or technical investigation by individuals who are interested in radio technique solely with a personal aim and without pecuniary *[monetary]* interest.

An Applicable Basic Amateur Radio Certificate Restriction

According to Radio Information Circular (RIC) 3

4.4.1 Basic Qualification

The following privileges and restrictions are applicable to the Basic Qualification:

- re-programming of radio equipment to operate in the Amateur Bands if this can be done by a computer program

Note: No physical modifications to the circuitry of the radio are permitted.

Land Mobile Service

Radiocommunications Regulations state:

Land mobile service means a radiocommunication service that provides for communications between mobile stations and

(a) fixed stations,

(b) space stations, or

(c) other mobile stations

Mobile Station

A Mobile Station is also defined on the ISED website as: "a radio station intended to be used while in motion and during stops."

Commercial Licence Radiocommunication Services and Stations

Per the Canada Radiocommunications Regulations:

s.3 It is a term of a radio licence that the holder of the licence may

(a) install, operate or possess radio apparatus to perform any of the following services, as authorized by the radio licence, namely,

(i) aeronautical service,

(ii) amateur radio service,

(iii) public information service,

(iv) developmental service,

(v) fixed service,

(vi) intersatellite service,

(vii) land mobile service,

(viii) maritime service, and

(ix) radiodetermination service; and

(b) install, operate, or possess radio apparatus at a fixed station, mobile station or space station as authorized by the radio licence.

Mobile Stations s.60 (4)

The radio licence fee payable in respect of radio apparatus installed in a mobile station that operates in the land mobile service is the applicable fee set out in item 5 of Part I of Schedule III for all authorized transmit and receive frequencies.

S.63 The fee, for the applicable metropolitan or other area, set out in Part IV of Schedule III for each assigned transmit or receive frequency (Sections 56 and 60) Fee Schedule Applicable for a Mobile Station in any Service other than the Amateur Radio Service

- Mobile station in the land mobile service – monthly $3.40 - annually $41.00

Licences, Certificates and Callsigns

The Amateur Radio Service requires the operator to hold an amateur radio operator's certificate. Traditionally, amateur radio operators were issued two separate authorizations: An Amateur Radio Operator Certificate and a radio station licence. The Amateur Radio Operator Certificate was issued for life and had no fee associated with it, while the radio station licence was issued on a yearly basis and a licence renewal fee was charged.

Effective April 1, 2000, ISED combined these documents into one authorization, the Amateur Radio Operator Certificate. This certificate is the sole authorization required to operate amateur radio apparatus in the amateur radio service.

A callsign is assigned when you receive your amateur certificate. This is required for the purpose of station identification. For a fee, additional callsigns can be requested by contacting the Amateur Radio Service Centre. Your callsign covers all your base, mobile, and portable radios at that location, and allows you to operate within any of the amateur bands (frequency ranges) for your certification class. Fixed stations at separate locations require a separate callsign for station identification.

A radio operator certificate is required only in the aeronautical service, maritime service, and the amateur radio service. (per s.33 of the Radiocommunications Regulations). A radio operator certificate is not required in the Land Mobile Service but each radio requires a separate licence (callsign); this is different than your Amateur certificate. So, if you own a mobile and a portable used on a commercial band, you would require two licences. You pay per radio, not per frequency in the radio, but each frequency in the radio must be listed on that radio's licence.

'Type-Approved' Radio Equipment

Contrary to Amateur Radio, commercial radio is *pre-programmed* to operate on specific frequencies and cannot be *user programmable*. So, you cannot actually "attempt" to transmit on an amateur frequency if it does not already exist in the radio. Commercial radio equipment must pass testing to ensure it does not create interference and is compliant with both ITU and Canadian regulations. This is referred to as being "type-approved". Radio equipment is approved according to the bands and purpose for which it is marketed, and a lower standard exists for amateur equipment than commercial. Unlike Amateur Radio, where we can choose our own frequency to operate (if it is within an Amateur band), commercial radios are not permitted to be frequency-agile. For example, a trucker cannot one day decide to set up a talk channel on a frequency that is not already designated and licenced by ISED for trucking. Commercial radios modified to be programmed by the operator in the field are not type-approved and can not legally be used on commercial frequencies.

A commercial VHF radio's frequency range will typically be capable of covering all or a portion of the amateur VHF band. The amateur VHF band is 144-148 MHz; you will find commercial radios with ranges of 136-174 MHz, 146-174 MHz, 136-152 MHz, or similar. So amateur frequencies *CAN* exist in a commercial radio, but they would have to be programmed in and the operator licenced to use them in a specific band.

Surplus and new commercial radios are readily available and may be programmed and used by amateur radio operators within the *amateur* bands for which YOU are certified. If you are an amateur radio operator and have a licence for your commercial radio, you can have your commercial frequencies and your amateur frequencies in the same commercial VHF radio, but they must be *professionally programmed* to avoid errors.

VHF and UHF commercial gear is better quality because they have more stringent specifications than amateur radios and have minimal operator controls for ease of use, typically only an on/ off and volume control, squelch, and a channel selector.

One more caveat. Since 1997 narrow band equipment has been implemented in North America for VHF commercial radio equipment. This means that twice as many channels can be assigned as each channel takes up only half the bandwidth. Channels are now specified narrowband (11 kHz) with a maximum transmitter power of 30 watts, or as otherwise indicated. *Amateur radio equipment is not narrow-band* and causes interference on narrow -band channels. This is one of the reasons Amateur radio equipment is not permitted on commercial frequencies. If you buy an older commercial radio it may not be narrow band and would no longer be type-approved for certain commercial frequencies.

So, amateur radios cannot be used to transmit on commercial frequencies, in part because they do not necessarily meet the specifications required for use in the commercial (land mobile) radio service, and in part because ISED does not want commercial users to be able to program frequencies on the fly, generally assuming that the commercial users are not radio hobbyists and therefore would not have the knowledge to correctly program a radio.

Lastly, it is not illegal to program an amateur radio to receive outside of the amateur band, or possess such a radio if you have a licence, but it's illegal to use it to *transmit* outside of the amateur band. Some amateur radios come from the factory able to transmit outside of the amateur bands, but this is not ISED approved.

LADD Frequencies

In Canada, the LADD (or LAD) VHF channels (Logging ADministration Dispatch) were originally intended for commercial trucking, general communications in forestry & logging, heavy mining, and exploration and petroleum. These are also known in Western Canada as the "Opens". Their use is governed by Industry Canada and require a licence and compliant, type-approved radio equipment. Click here for info about ISED licencing.

Due to the wider availability of low cost amateur VHF FM radios and the decline of CB Radio, recreational users have adopted them for back country communications and, for those who do not have reliable cellular service, especially survivalists and preppers, they are marketed as an essential communication resource. Users of LADD channels require *commercial type-approved equipment and require a corresponding licence for the radio - NOT AN AMATEUR RADIO LICENCE* to comply with the regulations. Also, in keeping with Spectrum Canada regulations, it is important to note that there are geographic restrictions where LADD channels can be used to prevent interference to adjacent users.

ISED has approved four LADD channel frequencies for radio licencing. Companies or individuals with only one or two radios no longer have to wait for a letter of permission from an existing radio channel holder in order to licence their radios. Their radio supplier can apply with ISED on their behalf for the use of 154,100Mhz (Ladd-1), 158.940Mhz (Ladd-2), 154.325Mhz (Ladd-3) and 173.370Mhz (Ladd-4) in their ISED approved commercial VHF radios. Larger companies may apply for a commercial (shared) channel frequency if they have many mobile vehicles needing to be dispatched from an office base station.

For legacy compatibility, LADD1-LADD4 channels use normal FM (FM is +/-5 kHz deviation, bandwidth 16 kHz, max bandwidth 20 kHz), while most of the other channels increasingly use Narrow NFM (NBFM is +/-2.5 kHz deviation, bandwidth 11 kHz, max bandwidth 11.25 kHz). Normal FM has slightly longer range than Narrow FM (see the RadioMaster article FM versus NFM for Best Radio Communications). If you are using NFM and reception is loud and distorted, try FM instead.

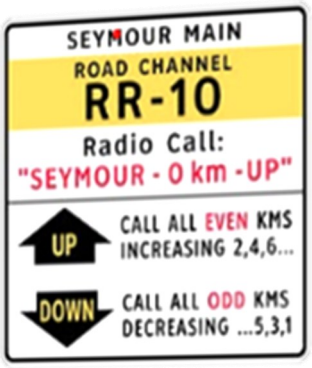
Resource Roads

Background

Mobile radio communication on resource roads had been historically highly variable across the Province of British Columbia (BC) for a multitude of reasons:

- Road users were required to know unwritten local protocols
- Heavy radio traffic caused overlapping calls and interference
- Radios had to be reprogrammed to local channels with each location change

...it is not illegal to program an amateur radio to receive outside of the amateur band, or possess such a radio if you have a licence, but it's illegal to use it to transmit outside of the amateur band



- Road signage was inconsistent and unclear

A standard mobile radio communications protocol was developed to standardize and simplify, and thus make travel on resource roads safer.

Refer to the ISED page RR — British Columbia Resource Road Channels

ISED RR channels are specified narrowband (11 kHz) with a maximum transmitter power of 30 watts, or as otherwise indicated. These channels must only be used in locations where it is specifically posted for usage. Improper usage, for example "chit chat", will result in harmful interference to other resource road and loading usages or to other priority radio spectrum users. All channels are designated such that they cause no interference to other users and must accept interference from other priority users.

Mobile Radio Station Licence Application

In the Province of British Columbia, Resource Roads are typically one or two-lane gravel roads built for industrial purposes to access natural resources in remote areas. Over 620,000 kilometers of roads on the British Columbia landbase are considered resource roads.

Two-way radios using these channels require a mobile radio licence. The use of amateur, marine or user programmable radios is not permitted.

The BC Forest and Range Practices Act regulates the use of these roads and radio communications. Outside BC check your applicable legislation.

FOREST SERVICE ROAD USE REGULATION *[current to 2020-07-28]*

Use of 2-way radio

s.5 (1) A driver on a forest service road who uses a 2-way radio to communicate with other drivers on the road must announce, in accordance with any road markers posted at intervals along the road,

(a) his or her position, and

(b) the branch of the road being travelled if the radio's signal can be received on more than one adjacent branch of the road.

(2) Subsection (1) applies to a driver only if

(a) the driver uses a radio frequency provided by the holder of a private commercial radio station licence, or other licence under the Radiocommunication Act (Canada) and the regulations under that Act, to communicate with the other drivers, and

(b) the forest service road is posted with a sign that indicates the radio frequency that is to be used.

*[Editor's note: This legislation says 'MUST announce, in accordance with any road markers' and appears to make it illegal for anyone **without** proper communications – i.e. a licenced commercial type-approved radio with programmed RR channels, to drive on a Forest Service Road if marked with RR signage.]*

Liability insurance

s.12 (1) A person must not operate or cause to be operated a motor vehicle or trailer, other than a motor vehicle or trailer described by section 2 (5) of the *Motor Vehicle Act*[1], on a forest service road unless

(a) the driver, motor vehicle and trailer are insured under a valid and subsisting contract of accident insurance providing insurance against liability to third parties in the amount of at least $200 000, and

(b) the driver carries written evidence, supplied by the insurer, of the insurance referred to in paragraph (a), or a copy of that written evidence, and produces it, on demand, to a peace officer or an official.

(2) Motor vehicles operated by the government that are subject to a government self-indemnification plan are exempt from the requirements of subsection (1).

[am. B.C. Reg. 354/2004, Sch. B, s. 2.]

[Editor's notes: [1]For clarity, the insurance exemption under section 2 (5) of the Motor

Vehicle Act referred to above is for farm implements.

If travelling on a Resource Road the vehicle or trailer must have third-party liability insurance of minimum $200,000 and proof must be carried and shown if requested by a peace officer or official.

A reminder also that anyone operating two-way radio equipment is subject to any applicable distracted driving legislation that may be in force.]

Offence

s.13 (1) A person who contravenes section 3 (3), 5 (1), 6 (5), 10 (1) or 11 (1) or (3) commits an offence and is liable on conviction to a fine not exceeding $5 000 or to imprisonment for not more than 6 months or to both.

(2) A person who contravenes section 4, 6 (3) or (4), 7, 8 or 12 (1) commits an offence.

Resource Road User Safety Recommendations

http://www.bcforestsafe.org/files/tk_pdfs/gde_resrd.pdf and Resource Road Radio Communications

Government in collaboration with industrial and other stakeholders has moved forward with implementation of standard radio communication protocols on Forest Service Roads (FSR) and other natural resource roads across the province. FSRs with industrial activity and many other resource roads have adopted and are using the standard protocols which consist of:

- standard call protocols - call content and order
- standardized signage
- dedicated, standardized bank of resource road radio channels

The standard bank of resource road mobile radio channels is available, to those with applicable *[NOT Amateur]* mobile radio licences, for programming at local commercial mobile radio shops.

It is important to note that not all resource roads have adopted the protocols and standard bank of resource road radio channels. It is recommended that road users retain current radio frequencies until such time that they are sure they are no longer required.

Most resource roads are "radio assist" and use of mobile radios for communicating location and direction is not mandatory. Always drive safely according to road and weather conditions and if using a mobile radio, do not solely rely on mobile radio communications recognizing that not everyone has or is using a mobile radio.

In the transition to new resource road radio channels and communications protocols, resource road users are advised to exercise additional caution when traveling on resource roads. Drive safely according to the road conditions and weather at all times. This should be communicated by employers to all their affected employees and contractors.

Most Forest Service Roads and natural resource roads are radio-assisted, but not all roads are radio-controlled. Road users are reminded not to drive exclusively according to the radio. Where posted, road users using mobile radios must use the posted channels and call protocols.

Channel Maps

A standard bank of resource radio channels has been provided by Innovation, Science and Economic Development Canada (ISED) for dedicated use for mobile radio communications on resource roads in BC. By agreement, the Ministry of Forests, Lands and Natural Resource Operations is responsible for administering the use of the standard bank of resource road radio channels in BC.

The standard bank of resource road radio channels has been distributed across the B.C. landscape to minimize the likelihood of interference. Channel assignment maps have been developed, and periodically are changed, to reflect channel assignments as planning tools. The maps should not be relied upon for appropriate channel selection in the field as in some cases, the channel assignments have not been implemented on the ground. The radio

channel signage in the field will always govern over the maps. See the mobile resource road radio planning maps:

Resource Road Radio Channel Planning Maps

Best management practices for mobile 2-way radio use on resource roads in BC, installation and maintenance

Radio requirements on BC resource roads (and elsewhere) will be for narrow-band communications. Radios manufactured after 1997 have this capability but older radios may only communicate with wideband transmissions. Wideband transmissions sound overly loud when received by narrowband radios and narrowband calls received by these radios may sound too quiet. Wideband radios should be replaced with newer, narrowband capable radios.

FRS, GMRS and Other Common Non-Amateur Frequencies

It should be no surprise to you that the licence exempt radios marketed for these bands are very low power and have narrow channel spacing. Licence exempt devices include cordless telephones, baby monitors, family radio service (FRS) walkie-talkies, remote garage door openers, or wireless local area networks. Although licence-exempt radio devices generally transmit signals at low-power levels, the power level alone does not determine if a licence from Industry Canada is required. By law, licence exemptions only apply to radio equipment that has been tested and certified to comply with specific technical standards and operates in specially designated frequency bands.

For the General Mobile Radio Service (GMRS) in Canada transmit power is capped at 2 watts by law, while the units sold in US can operate at 5 watts. Everything else is the same - frequencies and the communication standard. One needs a BS licence to operate a GMRS radio in the States (easily obtainable by anyone and does not require any test), but no licence is needed in Canada.

These devices may not be modified or fitted with different antennas. It is NOT permissible for you to transmit on any of these channels with your amateur equipment as you will exceed power and/or bandwidth limits. As with other frequencies, you may monitor them as receive only.

The answers to our original questions

Some VHF and UHF FM radios purchased for use in the amateur service can also be programmed to communicate on frequencies used for land mobile service. Under what conditions is this permissible?

C. The radio is certified under the proper Radio Standards Specification for use in Canada and is licenced by Industry Canada on the specified frequencies

You can wade through RSS-119 — Radio Transmitters and Receivers Operating in the Land Mobile and Fixed Services, but it all boils down to: "The radio is certified under the proper Radio Standards Specification for use in Canada and is licenced by Industry Canada on the specified frequencies."

And the answer to the second question:

Which of the following statements is NOT correct? A person may operate radio apparatus, authorized in the amateur service:

D. on aeronautical, marine or land mobile frequencies

You are certified to operate ONLY on the frequencies assigned to the Amateur Service. This means "on aeronautical, marine or land mobile frequencies" is incorrect.

So there it is. I'm not preaching but simply passing along the existing regulations and policy. These rules exist for a purpose. Do with it as you will but be aware that there is enforcement and you are subject to the penalties if you are caught.

~ John VE7TI

[Thanks to Kasun Somaratne (ISED) for the review of this article to confirm it reflects current ISED policy and regulation.]

Back to Basics II

John Schouten VE7TI

From The Canadian Basic Question Bank

Control Operators and Beacon Stations

An email caught my eye recently and that leads me to this issue's second Back to Basics column. The remarks in the email concerned one or more operators using a digital mode, FT-8 'robotically' to make contacts without the station operator actually present at the control point.

This touches on two areas of the Canadian Basic Question Bank. Control operators:

B-001-9-5 When must an amateur station have a control operator?

1. A control operator is not needed
2. Whenever the station receiver is operated
3. Whenever the station is transmitting
4. Only when training another amateur

And secondly, beacon stations:

B-001-8-2 Which type of station may transmit one-way communications?

1. Beacon station
2. Repeater station
3. HF station
4. VHF station

We'll look at both of these and also at interfering stations, although we will leave a complete examination of the latter for another issue.

The problem was related as follows:

"We have a few guys who are running robots on 50.313 here in Canada. This is creating problems for others trying to operate normally on FT8.

In one case in VE2 (Quebec) the watchdog timer seems to have been disabled. The owner claims he is doing nothing wrong… but technically its "harmful interference" by ISED definition".

Dana Shtun VE3DS, who contributes regularly to the Radio Amateurs of Canada magazine 'The Canadian Amateur' (TCA), offered this interpretation:

"Only a beacon station can transmit one-way comms… A control operator must be present when transmitting.

So technically beacons should be in the beacon sub band of the country… plus you could make a case for harmful interference IMHO if beaconing excessively on 50.313."

He concludes with the question: "Does this contravene the terms of the ham certificate if the robot is running and the station is unattended?"

If we look at the definition of Control Operator, it is as follows. The control operator is an amateur operator designated by the certificate holder of a station to be responsible for the transmissions from that station to assure

compliance with the Radiocommunication Regulations.

Furthermore, both the station certificate holder and the control operator are responsible for the proper operation of an amateur radio station and normally this is the same person, however if you are using someone else's station, then both of you are responsible for the proper operation of the station.

As a station owner, you are responsible for the proper operation of the station in accordance with the regulations. A control operator may be any **qualified** amateur chosen by the station owner. **A station must have a control operator whenever the station is transmitting**, be it yourself or someone qualified chosen by you, the owner. **The control operator must be at the station's control point**.

Not much doubt there! How about beacons?

In amateur radio a propagation beacon is a radio beacon, whose purpose is the investigation of the propagation of radio signals. Most radio propagation beacons use amateur radio frequencies. They can be found on LF, MF, HF, VHF, UHF, and microwave frequencies. Microwave beacons are also used as signal sources to test and calibrate antennas and receivers.

The International Amateur Radio Union (IARU) and its member societies coordinate beacons established by radio amateurs.

A typical use for a beacon would be to determine if you can hear it from your location. If you can hear the beacon on a specific band, them you can probably work other Amateurs on the same band and in that general location.

Beacons transmit one-way communication, generally in Morse code. We have one locally in the SW British Columbia area on 10-meters.

The interfering station mentioned at the start of this article would certainly be in contravention of the Act without a control operator being present, but may not necessarily be classified as a beacon station.

However, a transmission that disturbs other communications is called harmful interference. You are not allowed to disturb another station's communications unless you are transmitting a distress message. Depending on whether this station is in fact interfering with other users, or transmitting constantly, and adversely to other operators, could determine that it is creating harmful interference.

So, going back to our initial questions…

B-001-9-5 When must an amateur station have a control operator?

The correct answer is:

3. Whenever the station is transmitting

And, when a station is transmitting, its control operator must be at the station's control point.

As for beacons...

B-001-8-2 Which type of station may transmit one-way communications?

The correct answer is:

1. Beacon station

~ John VE7TI

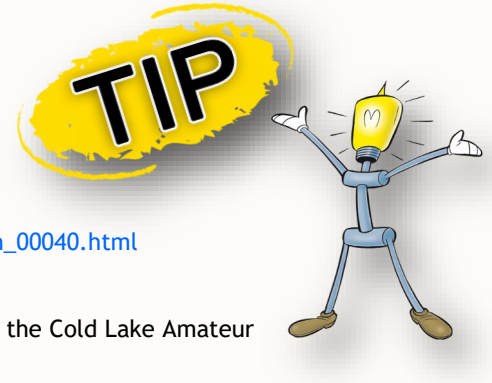
Here are the specific points we cover that talk about control operators in our Basic course .

Terms of Certification

- If you transmit from another amateur's station, both of you, the control operator and the station certificate holder, are responsible for its proper operation
- As a station owner you are responsible for the proper operation of the station in accordance with the regulations
- Any qualified amateur may be the control operator of an amateur station but whenever the station is transmitting it must have a control operator
- When a station is transmitting, its control operator must be at the station's control point
- Family members without qualifications must hold suitable amateur radio qualifications before they are allowed to be control operators
- The owner of an amateur station may permit any person to operate the station under the supervision and in the presence of the holder of an amateur operator certificate with appropriate qualifications

Study Links

Whether you are new to the hobby or brushing up on skills, you should find these study links helpful:



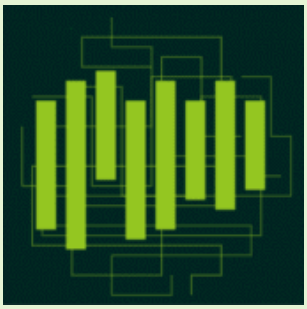
1. RIC-7 is the entire up-to-date Industry Canada (IC) Basic Question Bank. http://tinyurl.com/CanadaBasicQB
2. Industry Canada (ISED) on-line practice page: https://apc-cap.ic.gc.ca/pls/apc_anon/apeg_practice.practice_form
3. The Amateur Radio Exam Generator is at: https://www.ic.gc.ca/eic/site/025.nsf/eng/h_00040.html
4. The ExHaminer Study software for Windows is at: https://wp.rac.ca/exhaminer-v2-5/
5. There are plenty of good resources for both basic and advanced exam study courtesy of the Cold Lake Amateur Radio Society at: http://www.clares.ca/va6hal%20training.html

Contact SARC if you wish to write the Basic or Advanced Exam. If you pass we'll even give you a year's free SARC membership!

Newly Licensed? When you receive your paper certificate in the mail, it will come with a form that can be filled out and mailed to the Radio Amateurs of Canada office, at which point an introductory RAC one-year membership will be set up. Introductory memberships are identical to our existing basic memberships and you will receive The Canadian Amateur magazine for one year.

HAM NEWS

Smartphone App Helps Identify Unknown Data Modes



- Version: 1.2
- File size: 907.59kB
- Requires: Android 4.3+
- Package Name: com.tortillum.signalid
- Developer: Tortillum
- Updated: July 29, 2020
- Price: Free
- Rate 4.80 stars – based on 253 reviews

There's an incredible amount of radio signals.

It's impossible to know them all, let alone recognize them. So why not get help from SignalID?

At the moment, it recognizes about twenty signals (the exhaustive list is below) With only 5 seconds of recording time, it tries to recognize the signal.

To use it:

Set the frequency and bandwidth properly.

Selecting the frequency range. (0-30 MHz / Other) Place the microphone of the telephone near the loudspeaker. (The quieter the environment is around, the fewer errors will occur) Press the big button that dances.

Wait 5 seconds. (Time required for record)

Tips :

The algorithm is based on frequency, a wrong tuning of your radio/SDR will result in an erroneous detection.

The recording is limited to 5 seconds, for practical reasons. Recognition of a signal may require several attempts.

If you notice bugs, have remarks or suggestions, please leave a comment.

Here is the non-exhaustive list of recognized signals :

- RTTY (Commercial 85Hz, 170Hz, 450Hz, 850Hz, Amateur 170Hz)
- Pactorl (Standard, FSP, FEC, SELCALL)
- ASCII (170Hz)
- ALIS
- Codan8580 (200Hz, 250Hz)
- CIS36_50
- CIS40_5
- CIS50_50
- STANAG 4285 (GEN, SYS3000 FEC, 8PSK, TFC, IDLE, SYS3000)
- FT4
- FT8
- WEFAX (120, 240)
- 2G ALE
- 3G ALE
- CHIP64
- APRS (Burst)

And more!

Complete list in the application.

The app is open source !

https://github.com/Neosama/SignalID

https://www.youtube.com/watch?v=E-y1Ts1q2RU&feature=youtu.be

https://play.google.com/store/apps/details?id=com.tortillum.signalid

~ Stephen Walters G7VFY

RAC Band Planning Committee Update:

Proposed Two Metre (2m) Band Plan

As announced in The Canadian Amateur magazine, the RAC Band Planning Committee has completed the new proposed 2m band plan.

Radio Amateurs of Canada band planning committees coordinate the development of National Band Plans to provide guidance for the usage of the Canadian Amateur bands. These committees are made up of representatives from all regions of Canada.

The committees prepare interim band plans after consulting with Amateurs across the country. These plans not only take into account the wishes of Canadian Amateurs, but are also coordinated with band usage in other countries through membership in the International Amateur Radio Union (IARU).

The RAC Board of Directors extends thanks to the members of the RAC Band Planning Committee for undertaking the task of reviewing and updating the VHF and UHF band plans over the next year.

A draft of the band plans is provided on the RAC website at the link provided below for final input before it is submitted to the RAC Board of Directors for approval.

Draft plan: https://www.rac.ca/proposed-two-metre-2m-band-plan/

If you have any comments or suggestions please send them to Serge, Bertuzzo, VA3SB, RAC International Affairs Officer, at international@rac.ca.

~ Serge, Bertuzzo, VA3SB
RAC International Affairs Officer

RAC Band Planning Committee

Chair: Al Penney, VO1NO

Members:

- Bill Elliott, VE1MR
- Don Falle, VE2DFO
- Stuart Truba, VE2XX
- Dana Shtun, VE3DS
- Ernest Clintberg, VE6EC
- Ken Oelke, VE6AFO
- Skip MacAulay, VE6BGT
- Derek Hay, VE4HAY
- Mitchell Goodjohn, VE6SM
- Don Moman, VE6JY
- Grant Furnald, VE6TA
- Ed Frazer, VE7EF
- George Merchant, VE7GM
- Dave Miller, VE7HR

Calling all New Amateurs:
Get your Name in Lights!

Did you get your Amateur Radio certficate within the past year or two and want to introduce yourself through TCA to the Amateur Radio community? If so we would love to hear from you.

Drop a line to tcamag@yahoo.ca and tell us how you were introduced to the magic of Amateur Radio.

Do you credit any particular Amateur ("Elmer") with getting you started? Which aspect of the hobby do you enjoy so far?

Please be sure to include your name, call sign, date and level of certificate – and don't forget to include a photo or two. We hope to hear from you soon!

September 2020

Sun	Mon	Tue	Wed	Thu	Fri	Sat
		1 1930 SEPAR Net 2000 SARC Net	2	3	4	5 7:30-9:30 AM SARC Social: Kalmar Family Restaurant 8076 King George Blvd, Surrey, BC CONTEST: All Asian DX; QSO Party TX, AL
6 CONTEST: All Asian DX; QSO Party TX, AL	7 LABOUR DAY	8 1930 SEPAR Net 2000 SARC Net	9 1900 SARC Annual General Meeting [TBA}	10	11	12 7:30-9:30 AM SARC Social: Kalmar Family Restaurant CONTEST: WAE DX (SSB), QSO party TX, AL
13 CONTEST: WAE DX (SSB), QSO party TX, AL	14	15 1930 SEPAR Net 2000 SARC Net	16	17	18	19 7:30-9:30 AM SARC Social: Kalmar Family Restaurant CONTEST: QSO Party NJ, IA, NH
20 CONTEST: QSO Party NJ, IA, NH	21	22 1930 SEPAR Net 2000 SARC Net	23 1900 SARC Exec Meeting	24	25	26 7:30-9:30 AM SARC Social: Kalmar Family Restaurant CONTEST: CQ WW DX (RTTY), QSO Party ME
27 CONTEST: CQ WW DX (RTTY), QSO Party ME	28	29 1930 SEPAR Net 2000 SARC Net	30	For details on all SARC events, go to ve7sar.net For details on all SEPARS events, go to separ.shutterfly.com/calendar		

Contest Details: http://hornucopia.com/contestcal/contestcal.html

October 2020

Sun	Mon	Tue	Wed	Thu	Fri	Sat
For details on all SARC events, go to ve7sar.net For details on all SEPARS events, go to separ.shutterfly.com/calendar				1	2	3 7:30-9:30 AM SARC Social: Kalmar Family Restaurant 8076 King George Blvd, Surrey, BC CONTEST: QSO party CA
4 CONTEST: QSO party CA	5	6 1930 SEPAR Net 2000 SARC Net	7 1900 SARC General Meeting	8	9	10 7:30-9:30 AM SARC Social: Kalmar Family Restaurant CONTEST: QSO party PA, AZ, NV, SD
11 CONTEST: QSO party PA, AZ, NV, SD	12	13 1930 SEPAR Net 2000 SARC Net	14	15	16	17 7:30-9:30 AM SARC Social: Kalmar Family Restaurant CONTEST: QSO party NY, IL
18 CONTEST: QSO party NY, IL	19	20 1930 SEPAR Net 2000 SARC Net	21 1900 SARC Exec Meeting	22	23	24 7:30-9:30 AM SARC Social: Kalmar Family Restaurant CONTEST: CQ WW DX (SSB)
25 CONTEST: CQ WW DX (SSB)	26	27 1930 SEPAR Net 2000 SARC Net	28	29	30	31 7:30-9:30 AM SARC Social: Kalmar Family Restaurant

Contest Details: http://hornucopia.com/contestcal/contestcal.html

Radio-Active

John Brodie VA7XB

Profiles Of SARC Members

Reg Natarajan

I was born in Malaysia to mixed race parents. The Malay Muslims promptly had a revolution and my parents, who are not Muslim, decided to leave. I arrived in Canada in 1969 at age 4 with my parents and sister. Canada is the only country I remember calling home. We had the usual immigrant story – hard working parents with no money doing whatever it took to put food on the table. We lived in Richmond for most of my youth and then moved to Ottawa when I was 16. That was hard for me. I loved BC, hated Ottawa, and my father died shortly after that move.

I started moving around and did a lot of different things. I always had a talent for tech and started teaching myself programming. I landed a job in Calgary with a fairly large company in medical software and stayed in that industry for ten years with a couple of different companies. I moved back to the Vancouver area in 2001. In 2005, I got out of medical software and opened a data center in Surrey. I called it eSecureData. That was a ten year journey that saw me build two facilities, one in the Central City tower in Surrey and another in our own building in Coquitlam.

In 2015, I saw the market changing with huge players like Amazon, Microsoft and Google getting into the market so I sold the company to a local group that is still carrying it on successfully. I started a couple of small new online businesses with the following principles: these would be entirely online and hosted in other people's data centers, they would be entirely automated, and I would be able to run them from my laptop. I had spent 10 years tethered to my data centers and I wanted freedom.

Having a bit of cash and free time, neither of which I had had much of previously in my life, and certainly never at the same time, I decided to do a bit of travelling. I had always been drawn to the Colombian Andes and booked a flight

to Bogotá. That began another journey and a new chapter in my life. I met a girl (Isa) and married her. I remember having some errand to run in a tiny village in the High Andes called Mosquera. While there, we walked by a restaurant and my wife wanted to eat. The floor was gravel. The roof was a tent. People would ride their motorcycles up to the tables and stop to eat. Some Colombian guy was lopping chunks of meat off a roasting animal carcass with a machete. I wasn't in Vancouver anymore and I felt incredibly alive. I said to Isa, "let's live here". We stayed for four years, perhaps the best four years of my life. We never owned a car and spent our days walking around the village. I lost some weight and saw my health recover.

Here are some photos I took of Mosquera and the surrounding area.

https://www.flickr.com/photos/regnatarajan/albums/72157664214644620

In early 2019, we wanted change and moved to Medellín. It's everything Canada isn't, in both good and bad ways. It's crowded, dirty, uncivilized, corrupt, poor and filthy rich, ugly and startlingly beautiful, and as alive as a bee's nest. It's also always around 25°C and I feel wonderfully alive here, too. We had only planned to stay for a year but COVID hit before we could leave and I find myself stuck here, probably until the end of the year. It could be far worse. I am working a bit, but all online. I have no employees anymore. It's fair to call me semi-retired.

Below right is my home in the Bello suburb of Medellín.

https://photos.google.com/share/AF1QipMCelLTiWy5M0HcD8-AeOJ_VvR6b9cB8BrSZlMcf5YmlbK6tjA0XPbA2T696j6RRw?key=LVhtcU5ValRwN3hQVEg1S3AwWGFXT3hMbVNqdTR3

Views of Medellin, Colombia. Lower right, Reg's home in the Bello suburb.

Medellín isn't the hell-hole it was when the drug lord, Pablo Escobar, was alive. In the 90s, a westerner couldn't walk the streets here. Now it's safer than most American cities (the murder rate is about 20 per 100k, which is half that of St. Louis, for example). It's still far more dangerous than Vancouver and everyone needs to decide if the risk is tolerable to them. I've decided it is for me.

Here are some photos I've taken of Medellín and its most famous museum.

https://www.flickr.com/photos/regnatarajan/albums/72157691948225055

https://www.flickr.com/photos/regnatarajan/albums/72157709546156356

Under COVID, I mostly try not to go crazy. I am writing a lot of code for my new little businesses, and I do a bit of consulting work over Zoom for a couple of tech companies back in Canada. The restrictions here are far beyond anything Canada saw. Weekends are under full curfew. If you go outside, you get arrested. Even on weekdays, you can only go outside on your "pico y cedula" days which means the last number on your national ID card needs to match up to the number for that day. This week, I was allowed to go out on Wednesday and my wife was allowed out on Monday. If we go out together, we get arrested. I find it all very extreme, but they didn't consult me on it. :)

SURREY AMATEUR RADIO COMMUNICATIONS

Our current plan is to come back to Canada for a year or two and then move to Cartagena in Colombia. That's a city on the Caribbean Sea that I fell in love with when we first visited in 2017. It's a magical place, where cars are banned from the town center and people get around in horse drawn carriages. Cartagena is hot, sweaty and beautiful, as are most of its inhabitants. Here are some photos I took of it a few years ago.

https://www.flickr.com/photos/regnatarajan/albums/72157679371674843

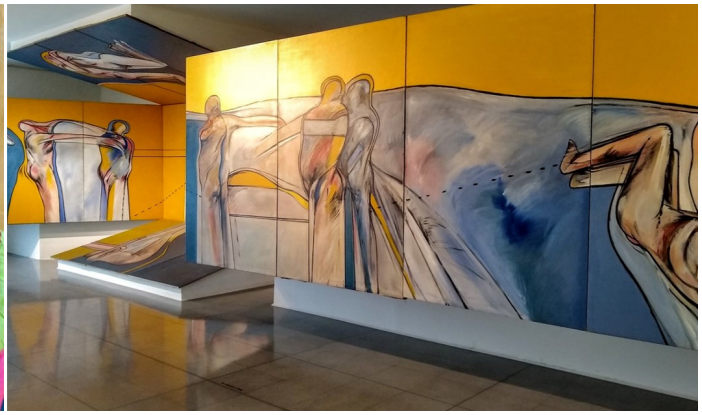
I got my ham certificate a few years ago, mainly because I'm very interested in emergency preparedness. I took the course at Vector and joined that group. I joined SARC when I realized Vector wasn't at all interested in the social aspects of ham radio. While stranded in Colombia during COVID lockdown, the weekly SARC net on Tuesday has become an important tie to home for me. It's a chance to hear some Canadian voices and interact with Canadians, which I don't have the chance to do here. I really value it.

My wife is also interested in becoming a ham, although English isn't her first language so the test will be a challenge for her. We'll look into that when we get back to Canada.

Here is a link to my Flickr: https://www.flickr.com/photos/regnatarajan/

Editor's note: In addition to being a world traveler and successful entrepreneur, Reg is an accomplished photographer. I had the difficult task of selecting a few photos from his flickr collection for this profile, but I guarantee you will enjoy clicking on the links to see the remainder of his work … they are fantastic.

~ Reg



SEPAR Report

Gord Kirk VA7GK
SEPAR Coordinator

I am writing this from my campsite reflecting on the last few months and wondering if I could ever have expected the series of events we have both been living and watching on our TV's.

The COVID-19 pandemics caused me to look at my personal preparedness with new eyes. I never expected a Toilet Paper shortage. We may have a laugh at this now but it was amazing to watch this unfold before us. As well many people have learned to explore and find creative ways to meet together outside to maintain connections with family and friends. Fortunately for Amateur radio operators we have seen an increase in Radio Net Participation and friendly chat's occurring via the first physically distant social network.

If you are a licensed Amateur Radio operator you have a key building block to personal preparedness looked after. Getting a license always seems like such a huge accomplishment and those who put the time in to study get the rewards. After the class is finished and the license obtained the real learning occurs in using your radio. Many of us think nothing of going and getting our radio, turning it on and calling out to speak with one of our friends. We can do this from home, in our car, or as I have even tried it this summer from a Kayak. Communication is one of the basic needs we all have and amateur radio does give us a tool that can work when others fail. If you are newly licensed and want help reach out to one of us and we can help you become active with your radio.

This is the purpose of SEPAR. To have trained radio operators ready to assist in providing communications should other traditional ways fail, or becomes overwhelmed. It has been years since anything has on a large scale required our activation, at least in Surrey. Around the world in just the last month earthquakes, hurricanes, disastrous fires, and rare weather events have upended regular infrastructure. This is

If you are a licensed Amateur Radio operator you have a key building block to personal preparedness

SURREY EMERGENCY PROGRAM AMATEUR RADIO

Its circling pattern of damage that lasted for a very long period of time put us directly in the bullseye of that drawn circle for many hours…

where amateur radio emergency services can really make a difference.

I have copied a note from an acquaintance of mine who just lived through the hurricane in the Louisiana area:

Just a quick check in.

Our family, neighbors, friends, and loved ones are all safe and doing well.

Our parish (aka county) is basically ruined in the infrastructure areas and in many other areas as well. Most of the damage is from downed trees, lines, poles, landlines, cell towers, electrical lines, gas lines, water lines, sewage systems, emergency systems… you get the idea (FUBAR). There are also many missing roof tops, store fronts, glass windows, and gas pump coverings that always fly like umbrellas.

They had a circle drawn on most weather station radar maps during the storm that showed an area in the center of Louisiana that had the brunt of the longest stationary slowing of the storm. Its circling pattern of damage that lasted for a very long period of time put us directly in the bullseye of that drawn circle for many hours…

Our landlines in this area were jerked out of the ground, broken, and flooded. Several cell towers were damaged and a few were completely knocked down. Communications are in bad shape here. My larger cell booster that was on our main power pole was jerked to the ground when the tree next to the house was picked and dropped. It is now stuck via it's magnet to the top of my Suburban until it can be tested and replaced if needed. We have some service but even less than the limited out in the yard cell service we had before.

The power will be out here for awhile. Long ago I fortunately chose to trade vacations and going out to eat and other such extras for saving towards generators that run on multiple fuels. We have a nice large 5 yr old natural gas/propane house size generator and we also have 2 yr old portable large genset that runs on gasoline and propane. Our battery banks are full, our solar panels were safely stored until the storm passed, and we have a small windmill generator to trickle charge for back up. I regret nothing I have sacrificed to obtain these items…

Our Internet is extremely poor and overloaded. The fair acts right along with the extreme traffic congestion by those using face time instead of texting short messages is causing a lot of problems. It has taken almost an hour to get on-line, stay on-line, and copy and paste this post because the Internet is timing out with so much usage.

In reading the above it makes one realize how important it is to be prepared.

SEPAR this fall

We will be continuing on our basics theme and encouraging and training everyone to have a basic home kit and be able to operate it well. Don VA7GL has been continuing the WINLINK Tuesday checkins and each week sends out an email via WINLINK with a question to answer. Many of us have been using Telnet to reply to his email and we want to move it to everyone being able to check in via RF. Please send Don an email at VA7GL@winlink.org to participate.

SURREY EMERGENCY PROGRAM AMATEUR RADIO

Our weekly 2m radio net will continue every Tuesday evening.

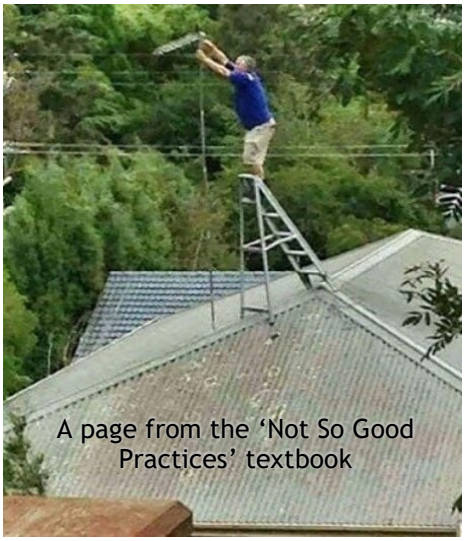
Another amazing tool we have available to us is APRS. Being able to transmit our location via our radios is another tool we have available to us. Jason VA7ITJ has offered to provide a session to SEPAR on this topic. Watch for the details coming out shortly.

The Great BC Shakeout. We will again participate in this event coming up in October. We have been discussing making this an exercise where some of the Fire Halls and RCMP District offices will be activated after the "Quake" SEPAR Volunteers will be needed for this event.

I am looking forward to the fall and us resuming some activities within the gathering limits set due to COVID. We will be continuing our ZOOM meetings and likely trying to work on some hybrid events live streamed will some limited attendance.

I hope you have enjoyed your summer and made a few radio contacts. I want to thank everyone for your continued support of SEPAR. If you want more information on SEPAR and how you can become involved please reach out to me directly.

~ Gord VA7GK
SEPAR Coordinator
VA7GK@shaw.ca



A page from the 'Not So Good Practices' textbook

separ
Surrey Emergency Program Amateur Radio

Name	Frequency	Offset	CTCSS
VE7RSC (Primary Repeater)	147.360	+0.600	110.9
VE7RSC (Secondary Repeater)	443.775	+5.0	110.9
VE7RPT (Primary Regional Repeater)	146.940	-0.600	Optional 136.5 Rcve
Simplex 1	(VHF) 146.550		
Simplex 2	(VHF) 147.420		
Simplex 3	(UHF) 446.550		
Simplex 4	(UHF) 447.425		

Other frequencies in the Greater Vancouver area:

Primary:	Coquitlam/Abbotsford	146.430
Primary:	Inter-Municipal Group 3	146.445
Primary:	Vancouver; Mission; Sec. Coquitlam	146.460
Primary:	Kent-Mission; Sec. Richmond	146.475
Primary:	Inter-Municipal Group 2	146.490
Primary:	New West; Sec. Richmond	146.505
National	Calling / FM Simplex Group I	146.520
Primary:	North Shore; Port Coquitlam	146.535
Primary:	Bowen Island; Surrey	146.550
Intermunicipal Group 1 Coordination		146.565
Primary:	Lions Bay/Vancouver/Delta/Langley	146.580
Primary:	Port Moody; Sec: Burnaby	146.595
Secondary:	Vancouver/Surrey	147.420
Secondary:	Vancouver (UBC) / Maple Ridge	147.450
Primary:	White Rock/Chilliwack; Sec. No. Shore	147.480
Secondary:	Burnaby/Pitt Meadows	147.510
Primary:	Delta; Sec: Abbottsford	147.540
Primary:	Hope; Sec: Delta; ALSO EMBC	147.570

SURREY AMATEUR RADIO

basiccourse

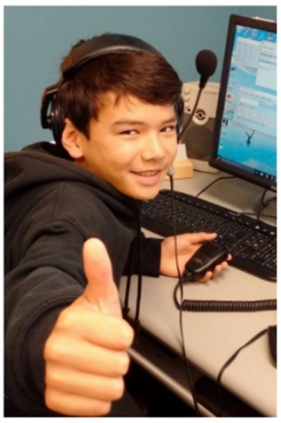
OBTAIN YOUR FEDERAL AMATEUR RADIO CERTIFICATE

Starts Tuesday, September 22nd—6:30pm

for information contact sarc@ve7sar.net

Surrey Fire Services Training Centre · 14901 64 Avenue · Surrey

(Limited seating and/or on-line if COVID-19 is active)



- Ideal for outdoors activities. Long range communications anywhere for free without commercial infrastructure
- Use satellite communication to speak around the world, perhaps even to an astronaut
- Participate in 'Radio Sports' like Contesting and Hidden Transmitter Hunts
- Enhance your personal and your community's preparedness in an emergency
- Use a radio, computer, smartphone or tablet for free worldwide digital communications
- Practice an exciting hobby or start a career opportunity

City of Surrey separ

Surrey Emergency Program Amateur Radio

https://separ.ca/

SARC

Surrey Amateur Radio Communications

http://ve7sar.net

Cost is $80 but we have a student and a family rate - Contact course@ve7sar.net for information

SARC Notes

John Schouten VE7TI

A Surprise Summer Course

While we had no intention to host a Basic course during the summer, there was so much demand, not only here in Surrey but elsewhere, that we decided to offer a special course strictly on-line.

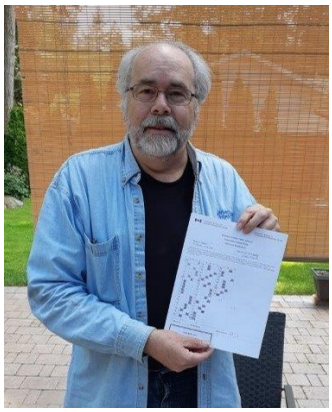
Students were provided access to our Canvas conference site. We started the site when our Spring course was unexpectedly interrupted due to COVID in March. We now have all our course material adapted to this form of learning and reaction has been favourable to date.

On September 22nd we will start our next scheduled course. We hope that we will have access to the classroom but, if not, we will repeat the on-line version.

Notable are the number of 4x4 and off-road enthusiasts we have register. Amateur radio is an ideal method to stay in touch in the back country and we have added material to the program specifically tailored to meet their questions and needs. Some of the questions deal with the legalities of the Logging ADministration Dispatch (LADD) and Resource Road (RR) commercial channels. With this in mind, see this month's Back to Basics column devoted to this oft discussed topic.

While not all attendees are in the course to become Amateur Radio hobbyists, we do hope that some will embrace it beyond just the convenience of VHF communications. Our goal is to boost the realization that Amateur Radio is an important emergency planning tool and to that end we emphasize participating in the Surrey Emergency Program Amateur Radio (SEPAR) and Neighbourhood Emergency Preparedness Program (NEPP).

~ John VE7TI



Congratulations to Steve McLean VE7SXM on recently passing the Advanced exam

With sadness we received word of the passing of Bill Little VE7ZBL who became a silent key on July 13. We had not seen a lot of Bill lately, likely due to his advanced age, but he was an active SARC member and Director about 10 years ago. Bill established a computerized membership database when our organization grew beyond a couple of dozen members.

Bill was a regular for several years at the weekly coffee meeting where he shared many stories of his experiences. He worked for Kodak and was stationed in South Africa. Bill was a photography and boating fan in addition to his Amateur Radio activities.

Bill had a lot of sadness in his life, having tragically lost two of his children. Our condolences go to his family for their loss.

The Annual SARC FoxHunt

John Schouten VE7TI

3 Months Late But Still Great

Curious about FoxHunting?
See: https://youtu.be/DMEKWOyaAnc

Amateur radio direction finding (ARDF, also known as radio orienteering, radio fox hunting and radiosport) is an amateur radio sport that combines radio direction finding with the map and compass skills of orienteering. It is a timed race in which individual competitors use a topographic map, a magnetic compass and radio direction finding apparatus to navigate through diverse wooded terrain while searching for radio transmitters. The rules of the sport and international competitions are organized by the International Amateur Radio Union. The sport has been most popular in Eastern Europe, Russia, and China, where it was often used in the physical education programs in schools.

ARDF events use radio frequencies on either the two-meter or eighty-meter amateur radio bands. These two bands were chosen because of their universal availability to amateur radio licensees in all countries. The radio equipment carried by competitors on a course must be capable of receiving the signal being transmitted by the five transmitters and useful for radio direction finding, including a radio receiver, attenuator, and directional antenna. Most equipment designs integrate all three components into one compact handheld device. (See Wikipedia and HomingIn for additional details)

Receiver equipment

Because no transmit capability is needed, no radio license is required. The radio equipment carried on course must be capable of receiving the signal being transmitted and be useful for radio direction finding. This includes a radio receiver that can tune in the specific frequency of transmission being used for the event, an attenuator or variable gain control, and a directional antenna. Directional antennas are more sensitive to radio signals arriving from some directions than others. Most equipment designs integrate all three components into one handheld device.

Les Tocko VA7OM has designed a top notch contest grade ARDF 80m receiver that is now available for general purchase. Inquiries may be sent to VA7XB@rac.ca.

Saturday, August 29 and it's a beautiful day! There is a 9am briefing prior to the 10am start. A practice fox has been set-up and hunters are trying out the new 80m receivers. They work great!

I'm introducing the first of my grandkids to this radio sport. They are 4 and 6 and are always up for a walk in the woods. The rest of the competitors are a mix of experienced and novice hunters.

At 10am we are given the signal to go and we venture out at a pace that a 4-year old can manage… s-l-o-w. Nevertheless I get the kids to count the dits designating

foxes 1-5. Each fox transmits for one minute with a callsign and a number of dits, so its 4 minutes until it transmits again. Two of them seem really close but I use the technique demonstrated by Les VA7OM, a veteran fox hunter and designer of this new receiver (https://drive.google.com/file/d/1a2mU5qEuA2GDaOr-EBwWiEiU_m7yxndp/view?usp=sharing) and manage to distinguish their separation. They find the first fox within 5 minutes just off the trail. Young eyes spot the flag and the 6-year old is given the task of reading the sign. Normally there is a punch and card but in this age of COVID 'hands-off' each fox has the name of an animal. She reads it successfully.

The next two are farther off but, when fox 4 transmits its signal, it too seems close. Another 5 minutes and that fox is in the bag as well. This seems too easy. Now there is a bit of a hike past a pond. The kids spot a large turtle on a log near the shore. We have to interrupt our hunt to admire nature. The turtle eventually dives in the water and the hunt continues.

Two other, teen participants run by us excitedly, hot on the trail. I think: "These guys will have a great time because of their energy and speed". We work through the next 3 foxes without much trouble and head for the finish. I tell the grandkids we've done very well. They ask if there are prizes, and I tell them there's a glass bunny (1st place) and a stuffed bunny (2nd place). They'd like 2nd place. This was initially called a 'bunny hunt' but somewhere along the line that changed to a fox hunt. I guess no one wants to hunt a cute little bunny, even though its just transistors and wires. At the finish we are told we are 2nd with 5 foxes in 41 minutes but in the Novice category… no prizes. We console them with cookies and all is fine.

They say they would like to go again… Two new FoxHunters initiated!

~ John VE7TI

Thanks to Les VE7OM and Anton VE7SSD for planning and arranging the SARC FoxHunt this year under difficult circumstances.

Expert 1st: Henry Dahl VE7HRY
30 mins
Novice 1st: Thomas Abbott ZS1TE
33 mins

Team Schouten: Halle (4), Martin VA7MOB, John VE7TI and Mya (6). Five foxes in 41 minutes

[below] Second place, Five foxes in 30 minutes

[above] John VA7XB. [below] Jean Luc VA7JLU and friend; and Ted VE7LEE shows Jim which way the foxes went; Les VA7OM and wife Sonia.

Ham Gear For Sale

For sale are **Four 8' long tower sections** = 32' free standing. The bottom anchors are missing as they were left in the concrete, after it was taken down. **$75.00 or best offer.**

Contact: Kjeld VE7GP 604 531 6396 or VE7GP@telus.net

RigExpert "AA-55 Zoom" antenna analyzer. Less than a year old. Purchased new at HRO in Portland, OR in January 2019. The unit has the original box, manual, all accessories and is in perfect shape. On sale price at HRO is US$328.95. That is $328.95 x 1.32 or C$434.21. **For sale at C$375.00**

70 cm Fast Scan TV Transmitter

For sale is an analog fast scan (NTSC standard) ATV transmitter in a hardened and waterproof metal case. Suitable for mounting outdoors. Last used by hams at Simon Fraser University on an emergency communications project in the early 1990s. Runs on 12 VDC. Approximately 100 feet of power/antenna/control cables included. As is, but if it doesn't work to your satisfaction you can return it. **$100 OBO.**

Contact: Kevin McQuiggin VE7ZD/KN7Q mcquiggi@sfu.ca

Kjeld has a rather **large Marine Radio (HF?)** sitting at his home and he'd like to find a new home for it. If you're interested contact him.

Contact: Kjeld VE7GP@telus.net

MFJ 269 antenna analyzer plus dipper coils $150

Covers 1.8 to 170 MHz and 415 to 470 MHz

IC 910H VHF/UHF all mode transceiver $1500
Fully loaded for 2m, 440 MHz, 1.2 GHz
Includes:
HM-36 hand mic and manual
UX910 (for 1.2 GHz operation)
FL132 (main band narrow CW filter)
FL133 (sub-band narrow CW filter)
CR293 (high stability crystal)
UT106 (DSP noise reduction/auto notch)

I can also provide at additional cost:
2m/440 MHz/1.2 GHz triplexer so you can use this radio on a single multi-band antenna and
CT-17 CI-V level converter for interfacing this and other radios to your computer

WANTED: **OLD NATIONAL GEOGRAPHICS AND READERS' DIGEST MAGAZINES. John VA7XB va7xb@rac.ca or 604-591-1825**

SARC 2020 Annual General Meeting

It is a challenging time we are all living in and we hope everyone is staying safe and healthy.

The SARC board of directors decided to postpone the AGM in June in order to adhere to provincial COVID-19 guidelines for physical distancing. While the pandemic situation is far from over, BC is starting to lift restrictions.

We will continue to follow the guidelines of BC's public health officers during this evolving situation but we have scheduled our 2020 AGM for Wednesday, September 9 starting at 7pm.

There are two possibilities. If we are given clearance to use the SFS classroom (our usual meeting location), then we will do so with strict COVID social distancing and hygiene measures in place. If not, we will convene at the Bear Creek Park east picnic area at 140th Street and 86A Avenue.

If this turns out to be an outdoor event, please bring your own lawn chair, and for either location bring your own refreshments as no food or drink will be served. Please keep 2m for social distancing.

We will notify SARC members no later than Monday, September 7 via email. Please check your inbox or spam for confirmation of the AGM venue.

We hope to see you there…

~ SARC Directors

PLEASE NOTE:

SARC Members will find an Annual General Meeting supplement at the end of this newsletter.

Your Membership May Be Overdue

If you have not already renewed, your membership in SARC expired as of last June 1st.

If you believe this is in error please advise and I will check it out. Otherwise, you are requested to renew your membership prior to the next AGM, which is tentatively scheduled for September 9th.

Note that only those whose membership is in good standing may vote or be eligible to run for a Director's position.

Payment may be made in one of several ways:

1. Use Paypal on the SARC website: www.ve7sar.net
2. If we meet, bring a cheque or cash to the AGM on September 9th.
3. Mail a cheque to our Treasurer Scott Hawrelak 13935 80A Avenue, Surrey V3W 6P5

Dues are as follows:

- Individual $31
- Individual (if RAC member) $26
- Family $41
- Family (if RAC member) $36

Thankyou for taking care of this as soon as possible.

~ John Brodie VA7XB
Membership

SARC SOCIETY DIRECTORS 2019-2020

PRESIDENT
Stan Williams VA7NF
president at ve7sar.net

VICE PRESIDENT
Anton James VE7SSD
vicepresident at ve7sar.net

SECRETARY / WEBMASTER
Jeremy Morse VE7TMY
secretary at ve7sar.net

TREASURER
Scott Hawrelak VE7HA
treasurer at ve7sar.net

DIRECTORS

Steve McLean VE7SXM

Kevin McQuiggin VE7ZD

John Schouten VE7TI
(SARC Publications/Blog)
communicator at ve7sar.net

One Position Vacant

SARC MEMBERSHIP, NET & CONTEST MANAGER
John Brodie VA7XB
membership at ve7sar.net

SARC QSL MANAGER
Heinz Buhrig VA7AQ
15684 102 Avenue
Surrey, BC V4N 2G4

SARC REPEATER MANAGER
David Sinclair VA7DRS
repeater at ve7sar.net

Is It Really Basic?

John Brodie VA7XB

I would estimate that 80% or more of the interest in ham certification nowadays comes from a community of casual users that includes off-roaders, outdoor enthusiasts, survivalists, boating and emergency preparedness interests. These folks have a legitimate interest in radio but strictly for the purpose of communication using the most readily available and suitable mode, i.e. FM or digital VHF/UHF with handheld, portable or mobile devices.

We also observe a greater awareness by the public and government agencies of the need for personal emergency self-reliance. The Neighbourhood Emergency Preparedness Program (NEPP) exemplifies this growing interest in in preparedness, one component of which is communication.

Whereas HF is rightly thought of as "traditional" ham radio and what drew many of us into the hobby many years ago, a new generation has emerged that is not really interested in the technology or hobby aspects of operating on HF. Yet it is HF theory, concepts and operation that consume the majority of the effort in obtaining a basic certificate.

Most certified hams will never use HF and what is learned simply in preparation for an exam is soon forgotten. The certification/licensing process requiring, typically, a commitment to 32 hours of classroom instruction plus additional study time is a disincentive to obtaining the legally required document. It is no secret that many of the off-roaders choose not to obtain a certificate of proficiency, rather they purchase a radio from the Internet or an unscrupulous dealer, learn to program it and operate illegally to communicate with their buddies, most often with impunity due to lack of enforcement. This situation is not in the interest of the legitimate users of amateur radio and simply encourages disrespect for regulations.

The other drawback to the conventional certification process is that as a result of the focus on HF concepts, it can be argued that insufficient time is devoted to those matters of vital importance to VHF/UHF operation, with the result that successful certificate holders are not properly prepared to operate these devices. For example, more time could be spent on how repeaters work, how to program radios, VHF/UHF antennas and propagation, traffic nets, proper operating protocols, digital messaging and the role of ER-focused organizations which they may choose to join.

Perhaps it is time to change the certification process so that those solely interested in VHF/UHF strictly for the purpose of communication do not need to learn about HF in a basic course. The course content could be reduced substantially, the time commitment and cost reduced accordingly with more intensive focus on things that all VHF/UHF'ers should know. With greater ease of certification, the result would undoubtedly be better compliance as well as better operators. The basic and advanced certification would accommodate the traditional HF concepts, and continue to be the route to HF operation. This approach suggests creation of an more fundamental level of instruction and examination, to supplement the existing basic, basic with honours and advanced certification.

~ John VA7XB

Well, it looks like Fall is about to arrive and we hope that COVID will permit us to resume some of our normal activities.

We usually start another great SARC season in September and this year we begin with our Annual General Meeting. There are a number of contests on the calendar so, whether we are able to participate as a team or individually, we will make the best of it.

The deadline for the November-December Communicator is October 20th. Please submit your stories, experiences, ads, etc. we need the content because our usual club news has been very sparse.

Take car, stay healthy!

SARC hosts an Amateur Radio net each Tuesday evening at 8 PM. Please tune in to the VE7RSC repeater at 147.360 MHz (+600 KHz) Tone=110.9, also accessible on IRLP node 1736 and Echolink node 496228.

On UHF we operate a repeater on 443.775MHz (+5Mhz) Tone=110.9 or IRLP Node 1737.

We are looking for SARC Net Control Operators. Its not a difficult job and, if you have some time to spare, we'd like to hear from you.

	SARC Net 20:00 Hrs
1st Tuesday Standby	Jean-Luc VA7JLU Vacant
2nd Tuesday Standby	Jinty VA7JMR Sheldon VA7XNL
3rd Tuesday Standby	Rob VE7CZV Vacant
4th Tuesday Standby	Kapila VE7KGK John VA7XB
5th Tuesday Standby	Vacant John VE7TI
Want a turn at Net Control? Contact the SARC Net Manager	

Down The Log…

SARC Monthly Meetings

2nd Wed. (Sept-Jun)
1900 hrs at the Surrey Fire Service Training Centre, 14923 - 64 Avenue, Surrey, BC. Here is a what3words link and map: https://what3words.com/markers.addiction.ozone

Weekly SARC Social

Saturday 0730 and 0930 at the Kalmar Restaurant 8076 King George Blvd. Surrey

SARC Net

Tuesday at 2000 hrs local on 147.360 MHz (+) Tone=110.9

SEPARS Net

Tuesday at 1930 hrs local on 147.360 MHz (+) Tone=110.9

VE7RSC Repeaters

2m North: 147.360MHz+ Tone=110.9Hz
IRLP node 1736
Echolink node 496228

2m South: 147.360MHz+ Tone=103.5Hz Fusion capable; No IRLP/EchoLink

1.2m: 223.960 Mhz -1.6 Tone=110.9

70cm: 443.775MHz+ Tone= 110.9Hz
IRLP node 1737

We Have A SARC Patch!

These are suitable for sewing on a jacket, cap or your jammies, so you can proudly display your support for SARC.

The price is $4 each or three for $10 and they can be picked up at a meeting or the weekly Koffee Klatch.

We thank our sponsors for their support of SARC

Please support them.

These folks did a great job on the hydraulics for our antenna trailer.

18549-97 Ave., Surrey, BC, V4N 3N9 604-882-9787

http://www.htihydraulics.com/about-us.html

HYDRAULIC TECHNOLOGIES INC.